THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. APRIL 12, 1894. CHICAGO, ILL. NUMBER 15.

MAGNOLIA METAL

IN USE BY

Eight Leading Governments.

BEST ANTI-FRICTION METAL FOR

High Speed Engine, Dynamo, Rolling-Mill, Steamship, Railroad, Saw-Mill, Cotton-Mill, Paper-Mill, Woolen-Mill Silk-Mill, Jute-Mill, Rubber-Mill, Sugar-Mill, Flour-Mill, and all Machinery Bearings.

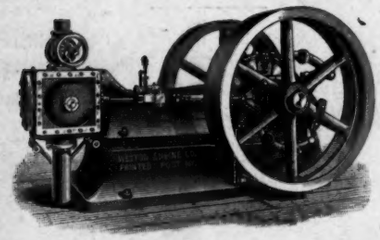
MAGNOLIA METAL CO.,

Owners and Sole Manufacturers,

London Office, 75 Queen Victoria St.
Chicago Office, Traders Building.

74 Cortland Street, NEW YORK.

WESTON ENGINES.



High Pressure Boilers.
Complete Power Plant.
Estimates and Drawings Submitted.

WESTON ENGINE CO.,
PAINTED POST, N. Y.

REPRESENTATIVES:
JULIAN SCHOLL & CO., 126 LIBERTY ST., NEW YORK, N. Y.
GEO. D. HOFFMAN, 82 LAKE ST., CHICAGO, ILL.
H. M. SCIPLE & CO., 3rd and Arch Sts., PHILADELPHIA, PA.

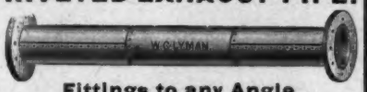
WALSTON—**COKE**—CONNELLSVILLE.

F. J. & H. R. POOL, Western Reserve Building, CLEVELAND, OHIO.

W. C. LYMAN, 49 Michigan Street, **CHICAGO.**

The original inventor of Exhaust Heads for END of Pipe above Roof.

RIVETED EXHAUST PIPE.



Fittings to any Angle and Radius.

LIGHT! STRONG! CHEAP!

MACHINERY

For Machine Shops, Brass Finishers and Metal Workers.

HILL, CLARKE & CO.,
12 and 14 South Canal St., Chicago, Ill.

W. ALLERTON, Pres. C. C. CLARKE, Sec. & Treas. ALFRED WEED, V. Pres. & Gen. Man.

ARCADE FILE WORKS.

Western Office and Warehouse, 23 Lake St., CHICAGO ILL. Works, ANDERSON, INDIANA. Eastern Office and Warehouse, 83 Reade St., NEW YORK CITY.

GREY IRON CASTINGS,

Light and Medium weight,
FINE QUALITY.
The Taylor & Boggis Foundry Co.,
CLEVELAND O.

RAINEY - -

Connellsville Furnace and Foundry

- - COKE.

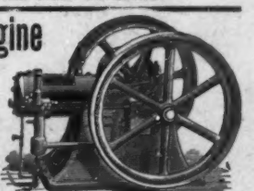
The only Coke you can buy and know you are getting th best that can be manufactured. All our works in the heart of the Region, within four miles of Connellsville, Pa.

CAPACITY, 4,000 TONS DAILY.

W. J. Rainey, Cleveland, Ohio

MAIN OFFICE:
MERCANTILE BANK BUILDING.

Gasoline Engine



The best because the most simple; a few minutes' attention a day will keep it running. Most economical; guaranteed cost of running is one cent per h. p. per hour.

Weber Gas & Gasoline Engine Co.,
For catalogue, ad. Drawer 215. Kansas City, Mo.

BUFFALO BLACKSMITH TOOLS.

PUNCHES, SHEARS, DRILLS, HAND BLOWERS, FORGES, ETC.

BUFFALO FORGE CO. BUFFALO, N.Y. U.S.A.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND. O.

ILLINOIS SCREW CO.,

50-52 S. Canal st., Chicago.

SHARON FIRE BRICK WORKS,

SHARON, PA.

No. 1 Silica Brick. No. 1 Mill Brick.

SILICA BRICK, FOR ROLLING MILLS AND STEEL SMELTING FURNACES, FIRE CLAY.

SHARON PA.

WILLIAM B. POLLOCK & CO., YOUNGSTOWN, OHIO.

MANUFACTURERS OF

STEAM BOILERS--EVERY TYPE--SHEET AND PLATE WORK.

Penstocks, Ladles, Oil and Water Tanks, Buildings, Cupolas, Blast Furnaces, Tanks, Smelters, Gas Producers, Converters, Receivers, Large Draught Stacks.

Riveted Pipe for Water, Gas, Air or Steam. Plate Construction--All Kinds.

STILWELL'S

PATENT LIME-EXTRACTING

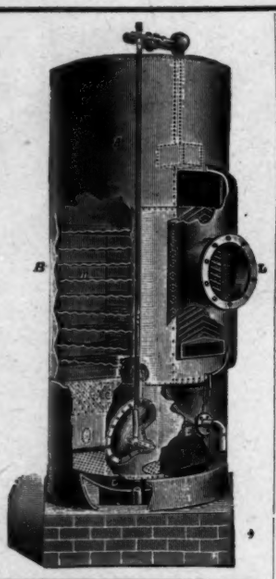
HEATER AND FILTER

COMBINED.

Is the only lime-extracting Heater that will prevent Scale in Steam Boilers, removing all impurities from the water before it enters the boiler.

. Thoroughly Tested. .

OVER 8,000 OF THEM IN DAILY USE.



ILLUSTRATED CATALOGUES.

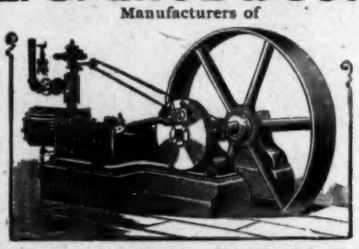
Stilwell-Bierce & Smith-Vaile Company,

DAYTON, OHIO.

CHICAGO OFFICE, 63 S. Canal St.

L. SPENCE & SON,

Manufacturers of



STATIONARY ENGINES, 20 TO 100 H. P.

Portable Engines,

THRESHING MACHINES,

—AND—

Large Engines for Rolling Mills and Blast Furnaces

Send for illustrated catalogue.

Martin's Ferry, Ohio.

M. V. SMITH, Pres. C. C. MORROW, Sec.
M. A. GREEN, V. Pres JOHN A. ELLIOTT, Treas

ARTIFICIAL GAS ENGINEERING COMPANY,

Consulting and Contracting Engineers,

706 Times Bldg., PITTSBURG, PA.

ARTIFICIAL GAS applied to all branches of manufacturing and domestic uses. Apparatus for the manufacture of coal-gas furnished at lowest prices.

THE KILBOURNE & JACOBS MFG. CO., Columbus, Ohio, U. S. A.

Largest manufacturers in the United States of Wood and Steel Wheelbarrows, Charging Barrows, Dump Carts, etc. Goods guaranteed superior to any others upon the market. Prices moderate. Write us for catalogue and prices before purchasing elsewhere.

GASOLINE ENGINES.

Stationary & Portable

ALL SIZES.

Dwarfs in size and Giants in Strength.

Costs only 10 cents a Day per H. P. to run them, & scarcely any attention.

EVERY ENGINE GUARANTEED

Write for particulars and testimonials.

THE VANDUZEN GAS & GASOLINE ENGINE CO.

CINCINNATI, O.

Mention this paper when you write.

CARY & MOORE

CHEMISTS,

1760 Monadnock Building, CHICAGO.

ANALYSES OF ORES, MINERALS, IRON, STEEL AND OTHER METALS,

ALSO OF

WATERS, OILS, COAL, AND FOUNDRY SUPPLIES.

GOLD AND SILVER ASSAYING.

Any time you are in the market to buy

STEEL RAILS,

write to us. We can furnish any weight of New Rails; we have for immediate delivery 400 tons of second-hand 60 lb. Steel T Rails, 100 tons of 35-lb. girder and 300 tons of 45-lb. flat steel, all fit to relay.

ROBINSON & ORR,

419 Wood St., PITTSBURG, PA.

ROBERT W. HUNT & CO., Bureau Inspection Tests and Consultation.

Advice on iron and steel questions, analysis of ores, oils and waters; economical tests of steam engines and boilers.

1137 The Rookery, CHICAGO; Arcade Building, CLEVELAND; Hamilton Building, PITTSBURG; 328 Chestnut St., PHILADELPHIA; 80 Broadway, NEW YORK.

H. L. HOLLIS. F. A. EMMERTON.

HOLLIS & EMMERTON

ANALYTICAL CHEMISTS.

Mining and Metallurgical Engineers.

ADVICE GIVEN ON FOUNDRY MIXTURES.

Analyses of Ores, Slags, Metals, Fuels, FOUNDRY SUPPLIES, ETC.

1232 The Rookery, CHICAGO. 804 Perry-Payne Bldg. CLEVELAND.

Screw Plates and Dies.

Drop Forged from the

Best Bar Steel.

These Screw Plates have a new and novel arrangement for holding the dies, making them the most convenient tool of this kind made.

THE BILLINGS & SPENCER CO. - Hartford, Conn.

Drop Forgings of Every Description.

DICKMAN & MACKENZIE,

CLEVELAND, 71 Atwater Bldg. CHICAGO, 1224 Rookery Bldg.

Mining properties examined. Ores sampled at mines, furnaces and all lake ports.

General analyses of Ores, Slags, Metals, Fuel, Foundry Materials and Products, etc.

CHEMISTS AND ENGINEERS.

THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. APRIL 12, 1894. CHICAGO, ILL. NUMBER 15.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

The feeling of uncertainty which pervaded the iron market a week ago, on account of the Connellsville coke troubles has lessened. While the strikers have decided to keep up the struggle, there is scarcely an idle oven north of Connellsville, and it has been demonstrated that not enough workers can be kept out to interfere with shipments on the present reduced scale of demand. A few furnaces were banked because of interrupted shipments, but the strike has had no effect whatever on prices. Bessemer iron has been rather freely bought within the past week, some of it evidently on speculative account. The market has been $9.75@$9.80, Valley furnace. A firmer feeling is reported, owing to the fact thrt several important producers are quite well sold ahead, but buyers are not willing to pay more money. Billets maintain about the same position as in the preceding week. Transactions are at $15.50, Pittsburg. Some mills are so far sold up that they cannot accept orders for early delivery but there is no urgent demand. In the Eastern markets buyers are unwilling to engage forward deliveries except at $17, Philadelphia, but this is refused owing to the uncertainties of the present low freights. Southern sellers of pig iron report more activity, due in part to the recent freight reductions, which have enlarged the market for Alabama iron. While the concessions were designed to help furnacemen, buyers expect to be given the entire reduction and in most cases are not disappointed; but the struggle comes in the case of buyers who want reductions on old contracts because freights have gone down. Sellers naturally fight off on such requests. Virginia and Western Pennsylvania producers have been making extremely low quotations in the Eastern market and in the competition with local furnaces buyers have got prices never before touched. The result has been larger buying. It is plain in nearly every department of the market that buyers are concluding that reasonable requirements for the future cannot longer go uncovered, with safety. Mills, both Eastern and Western, report a better supply of work, at declining prices. Nowhere in the finished material market does the downward tendency appear to be arrested. Following the flurry in wire rods some weeks ago, there was a period of inactivity, both buyer and seller being loaded up. There is now a renewed effort to sell by a few producers and Pittsburg firms have made low offers in Chicago. Quotations are below $24, Pittsburg. Wire and wire nails are also lower. The structural material demand, on bridge and architectural account, is of fair proportions. In Chicago, building trades' troubles have begun to call a halt, but a prolonged struggle does not seem probable.

THE CLEVELAND OUTLOOK.

While it is not probable that the coke strike has spoiled any pending ore sales, it has furnished furnacemen with a fresh reason for delaying arrangements for their ore supply for the latter half of the year. Among those who have not yet covered their requirements, there is no haste to buy. It is evidently a wait for something to turn up; not for lower ore prices to be made, for that is not expected, but rather for some development that will give point to the belief of some ore sellers that an advance is apt to come before the shipping season ends. The attitude of the Mesabi Consolidated interests is made somewhat plainer by the low price made on ores which it mines. The speculation that has been indulged, whether ore production or ore carrying would weigh heavier in the syndicate's calculations, will not long go unsettled. Only with a heavy demand for Mesabi ores can the syndicate make a showing both as a producer and a carrier. If it seeks the largest possible output for its non-royalty-paying mine, by bringing it into competition with mines having high royalty charges, the effect upon its railroad income is evident. There has been a slight increase in working forces on the Mesabi, preparatory to getting out ore, but mining operations will largely wait on sales. On other ranges curtailments and additions to working forces about balance. Among vessel men there is a large contingent who aver that 30-cent coal and 80-cent ore have no profit in them and they will not send their boats out at these rates. If it be true that these boats can more profitably remain tied up than go into commission on the present basis, it would appear that some one must offer them more money if they are to take part in the season's carrying.

Pig Iron. Latest reports from the coke region are somewhat more disturbing to furnacemen, and if the general miners' strike ordered for April 21 should involve Connellsville workers, as it is likely to, there may be a shortening of furnace operations before the end of the month. However, there is no advance in the price of Bessemer pig, though, in view of sales they have made in the week, several vallley producers are a little firmer in their position. Several 10,000 ton sales have been made in the past ten days, some of the iron being taken by brokers, at $9.75 furnace. Some furnaces in the Pittsburg district have been banked owing to coke shortage. In the valleys production is almost entirely confined to Bessemer iron, and some furnaces are well sold ahead.

Finished Material. Building operations have caused a fair demand. A new court house at Toledo, calling for several hundred tons of material brought out a scramble for the work and prices another notch lower. The ground is still sinking under producers of whatever kind of mill material. Plates and beams and channels have all hovered unpleasantly near the 1c. basis, but the lowest prices have been available only in the few desirable contracts most widely competed for.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The recent reduction of freight rates on Southern iron has not, as yet, resulted in any great benefit to the Southern furnaces in the way of increased sales, but on the contrary seems to have made buyers a little more timid about coming into the market, feeling, no doubt, that should they buy, there is a possibility that still another reduction in prices might be made. As a consequence, very little business has been done in pig iron in the past week, and there appears to be only a very little, if any, business in sight for the immediate future. Sales have also been hurt by the impending strike by the laborers in the building trades unions, which promises to be quite serious. In finished material the week shows no improvement, orders being restricted to small lots. While the local rail manufacturers report a good outlook for the future, the actual tonnage booked in the past week is small.

PIG IRON.—Sales of Southern iron are a little larger in number, but the total tonnage for the week is, if anything, a trifle smaller than in the week previous. Local coke is quiet, with one or two sales of several hundred tons and a fair carload trade. Several small sales of Lake Superior charcoal have been closed. Local furnaces have met the reduction of Southern prices caused by reduced rates, and according to a prominent Northern furnace man, are fully prepared to meet any that may yet come. The Southern rates, which last week only applied to Chicago business, have since been made to cover all Chicago territory.

BARS.—A rumor was current last week, that one of the railroads is in the market for 1,000 freight cars, which would mean a large order for bar iron. So far nothing has developed, and the bar men have not been asked for prices. Trade is quiet, except in small orders, of which there is a fair number. Quotations are made at 1.10c to 1.15c for both steel and iron, Chicago.

STRUCTURAL MATERIAL.—A slightly increased demand appears, but no large orders have been placed, and there are none in the market. Prices are made: Beams and channels, 1.35c to 1.40c; angles, 1.30c to 1.35c; plates, 1.35c to 1.40c; tees, 1.50c to 1.60c.

RAILS AND TRACK SUPPLIES.—A very good inquiry is noted for light rails for street railroad service, and the chances are that good orders will be placed in the near future. Heavy rails have had only a small sale, though several good inquiries have come up. Prices are unchanged. Rails, $25 to $27; splice bars, 1.40c; track bolts, 2.30c to 2.40c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—Advices from Pittsburg are that quotations on billets are considerably stiffer, and the local market, as a consequence, is slightly toned up. Quotations are unchanged, however, at $17.25, with no sales. The local mills are sold up on rods and the price is nominally $26.50. A Pittsburg sales agent was offering rods at a little under this figure in Chicago last week, with no buyers.

PLATES.—A few small orders have been closed, but the week has been a quiet one. Prices are made. Tank steel, 1.35c to 1.40c; flange steel, 1.65c to 1.75c; firebox steel, 3.75c to 4c; boiler tubes, 75 per cent. discount.

MERCHANT STEEL.—A fairly good inquiry is being received, and sales for small lots are quite frequent. Quotations are continued: Open-hearth spring, machinery and tire steel, 1.85c to 1.90c; crucible spring, 3.50c; machinery, 4.50c to 4.75c; tool steel, 6½c and upwards.

SHEETS.—Quite a good inquiry is being received for black sheets, with fair sales. Prices are still made at 2.35c to 2.40c. In galvanized iron business has picked up a little, with quotations unchanged at 75 and 10 and 5 per cent. discount.

OLD RAILS AND WHEELS.—The market is quiet, and prices only nominal. Old iron rails $10.50; old steel rails $7 to $10, according to length, etc.; old wheels $10.50 to $11.

SCRAP.—Business is very dull. Nominal prices are: No. 1 forge, $9; No. 1 mill, $6 to $6.50; No. 1 machinery, $7; axles, $13; cast borings, $3.50; wrought turnings, $4; axle turnings, $5.50; mixed steel, $5; coil steel, $7; leaf steel, $8; locomotive tires, $8; heavy cast, $7; stove plate, $5.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The troubles in the Connellsville region have caused the temporary banking of a few furnaces in the Pittsburg district, but now that the backbone of the strike is broken and operations are being resumed at ovens whose product is in demand, it is not expected that the output of pig iron will be sensibly reduced. The feature of the week's business has been the purchase of considerable blocks of Bessemer iron at $10.40 Pittsburg, or $9.80 Valley furnace. There is a somewhat firmer feeling, owing to the fact that most makers of Bessemer are quite well supplied with orders, but this feeling is not apparent in any stiffening of prices. Buyers cannot be found who are willing to pay more. The billet mills hereabouts are well sold ahead, as a rule, and Edgar Thomson is running on rails; there would thus be a firmer market if buyers were as numerous as for several weeks past. Under the circumstances, there is a diversion of orders to the Wheeling district, and the activity of mills there has not been paralleled in months. Finished material is practically unchanged. Possibly more inquiry is to be noted, but no contracts of importance have been placed. Founders tell of a slight improvement, but it has not helped the foundry iron market perceptibly. Wire rods, wire and wire nails are lower. Rods can now be purchased at less than $24 mill, and offers have been made at low prices in markets farther West, but without bringing business. Muck bar is nominally $19, with practically no sales. We hear of sales of grooved iron skelp at 1.22½c, and of sheared steel skelp at 1.05c. In structural material beams are in greater demand, and quotations are still 1.15@1.20c up to 15 inches.

Buffalo. The suspicion that there was a slight improvement in demand has been confirmed by transactions of the past week, but the keenest vision is unable to discern anything that looks like improvement in price.

Detroit. F. B. Stevens, 74 Griswold street, takes this view of the pig iron outlook: "An improvement, however slight, is more than welcome, and this month so far shows a fair increase over last in sales of Lake Superior charcoal pig iron. There is, however, much chance for further improvement, and all that is needed is the buyer anxious to purchase. Some shipments are being made to-day at $14.50 f. o. b. cars here which is not saying that it could not be bought for less. A recent sale was made by an interior furnace at a lower figure for a large quantity, but the character of that iron differed so greatly from the general product marketed here that the prices could hardly be used in comparison. This feature is too often overlooked by buyers anxious to record

(Continued on Page 6.)

THE IRON TRADE REVIEW

DEVOTED TO
IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND:
27 VINCENT STREET.
A. I. FINDLEY, Editor.

CHICAGO:
1141 MONADNOCK BLOCK.
B. M. GARDNER, Associate Editor and Western Manager.

TERMS OF SUBSCRIPTION, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER.

APRIL 12, 1894.

PIG IRON WARRANTS AND THE DEPRESSION.

The depressed state of the blast furnace interest has led to an enlargement of the storage business of the American Pig Iron Storage Warrant Co. in the past year; but the same conditions have been fatal to activity as far as the speculative features of the warrant system are concerned. A steadily falling iron market almost from the establishment of iron warrant operations in the United States has made this field of operations an unattractive one for speculators. Yet it is not difficult to see that a spurt of activity in warrants might attend a period such as the present if would-be speculators could be convinced—as most authorities in the trade are convinced—that the bottom of the declivity has been reached. It is not unlikely that the English capitalists who bought warrants last Fall, though at prices higher than to-day's, will see the market sweep past the syndicate's cost figure, in the final upward movement. That a permanently lower level is to follow the decline of the past year is generally conceded, but it is as generally agreed that there will be a distinct advance from to-day's basis. It is not surprising, therefore, that buyers are contracting for good sized blocks where they are given the benefit of a liberal share of the freight reductions recently granted to Southern shippers.

The statistics of the American Pig Iron Storage Warrant Co. show that March had the largest record for iron put in storage, of all the months since the panic began. Stocks in yards Dec. 31, 1893, were 85,700 tons. On April 1, the total was 96,100 tons. In January, 3,800 tons were put in and 1,400 tons taken out; in February, 3,000 tons were put in and 1,700 tons taken out; in March, 7,600 tons were put in and only 200 tons taken out. While the intentions of the promoters of the enterprise have undoubtedly been the establishment of a speculative market for pig iron with regular trading, after the manner of grain and oil exchanges, events have made the system quite innocuous in this particular. But its provisions for the close grading of iron and its compliance with the legal requisites of a good security seem to have made it increasingly the recourse of furnacemen, to tide over intervals of slow sale. On the other hand there are producers who will have none of it—and least of all in times like the present—closely gauging their operations to the consump ive demand, and with prices of their raw materials falling, seeking to work up whatever is on hand and put iron on the market, rather than pay interest on stored product.

NEW CANADIAN IRON TARIFF.

The tariff bill introduced by Mr. Foster, Canadian Minister of Finance, in the Dominion House of Commons, on March 29, became the law of the land the hour it was thus presented. It may be modified in some of its features, in the consideration it is now receiving, but in the main it is not likely to be greatly changed after the thorough-going work put upon it in the committee stage. We do not find in the bill any encouragement to expectations of a larger Canadian market for the iron and steel products of the United States, and not the trace of a disposition to put Canada on any such footing as the Wilson bill would put the United States. The protectionists in the Canadian ministry have learned too well for that. The argument advanced by Ontario manufacturers that they should have the privalege of getting coal free of duty from the United States, if New England manufacturers are to have free Nova Scotia coal, as under the Wilson bill, fell on dull ears, for the new tariff retains the 60-cent duty on bituminous coal. There was no disposition, moreover, to pattern after the Wilson bill as to agricultural implements. The ad valorem duty is reduced from 35 to 20 per cent., but that is yet some distance from the free list provision of the Wilson bill. It is not unlikely that the United States Senate may be persuaded to adopt the clause proposed by the implement manufacturers of this country imposing the same duty on agricultural machinery imported to the United States that is put on like imports in the country from which it comes. This would even up the account with Canada.

The items in the new tariff of most interest to the iron and steel and metal trades are the following: Wrought scrap iron or steel, fit only to be manufactured, $4 per ton; old, $2. Pig and scrap iron, ferro-silicon and spiegeleisen, no change; old, $4. Ferro-manganese, 10 per cent.; old, $2. Iron and steel ingots, blooms, slabs, billets, bars, etc., $5 per ton; old, $9. Bar iron and steel, $10 per ton old, $13. Iron and steel plates or sheets, $10 per ton; old, $16. Iron and steel rails, 30 per cent. ad valorem; old, $6 per ton. Cast-iron pipes, $10 per ton; old, $12. Boiler tubes of wrought iron or steel, including corrugated tubes or flues, 30 per cent. Forgings of iron and steel, 35 per cent.; no change. Rolled iron or steel angles, channels, structural shapes and special sections weighing less than 35 pounds per lineal yard, n. e. s., 35 per cent.; no change. Rolled iron and steel angles, beams, channels, etc., thicker than ⅜ inch, wider than 15 inches, and weighing more than 25 pounds per lineal yard, 12½ per cent.; no change. Iron bridges and structural iron work, 30 per cent.; old, ¼ cent per pound. Malleable iron castings and steel castings, 25 per cent.; old, $25 per ton. Cut rails and spikes, ¾ cent per pound; old, 1 cent per pound. Marine boilers, 7½ per cent. ad valorem; old, 15 per cent. Engines, boilers and machinery, 27½ per cent. ad valorem; old, 30 per cent. Portable engines and pumps, 20 per cent. ad valorem; old, 35 per cent. Wire rope, iron and steel, 25 per cent. ad valorem; no change.

We give the above more important items in the metal schedule to indicate the tenor of the bill, which, on the whole, aims at moderate reductions. It would be noticed, if the whole measure were reproduced, that the ad

valorem principle has been adopted to a greater extent than before, the Dominion ministry taking the same step backward that was persisted in by Chairman Wilson and his associates.

It will be seen that the duty on scrap iron is raised from $2 to $4. This is designed to encourage the puddling of forge iron produced in Canadian blast furnaces. Today the rolling mill output of Canada is largely a scrap product. With a bounty on pig iron produced at home and a doubling of the duty on scrap, encouragement is to be given to the smelting of Canadian ores and carrying the product along into the various forms of finished material.

The duty on structural material remains the same. Some of the mills in the Central West having a large output of structural shapes, have made some effort to get orders at Ontario points, of late, believing that at the ruinously low prices now ruling in the United States, they might be able to pay the Canadian duty and compete with the shapes of English, German and Belgian makers. All such calculations have been disappointed. It is found that even with the short haul from mills in Pittsburg and Cleveland, Belgian manufacturers can put down structural material in Hamilton and other Ontario points at a lower price. Belgian mills, by the way, rather than English mills, are getting the lion's share of the business with Canada in bridge and architectural material. This fact only goes to show that under the ad valorem duty of the Wilson bill, which is 30 per cent., instead of the 35 per cent. on lighter sections, in the Canadian tariff, our Eastern market would be an easy prey to the cheap product of Belgian and German mills.

FEBRUARY IMPORTS OF IRON AND STEEL.

The table below is compiled from Treasury Department statistics and shows the imports of iron and steel into the United States in February of 1894 compared with those of February, 1893. In the same connection are given the totals for eight months ending Feb. 28, 1894, and Feb. 28, 1893:

	Month ending Feb. 28,		Eight months ending Feb. 28	
	1894	1893	1894	1893
	Tons.	Tons.	Tons.	Tons.
Pig iron	1,856	4,155	20,673	36,216
Scrap iron and steel	22	373	1,905	16,250
Bar iron	303	976	8,888	13,903
Steel and iron rails	.....	22	2,176	250
Cotton ties	.....	186	800	1,058
Hoop band or scroll iron	68	111	441	812
Ingots, blooms, etc	440	2,337	9,498	19,146
Sheet iron and steel	1,900	2,332	18,333	24,985
Tin plate	17,393	18,341	131,114	163,033
Wire rods	1,023	1,625	17,575	28,906
	23,005	30,458	211,408	304,559

The disparity is less than appeared in the January figures, which were 21,478 tons and 40,706 tons for 1894 and 1893 respectively—a falling off of nearly 50 per cent. The pig iron record is particularly worthy of note, as is that for ingots, blooms, etc. Tin plate imports hold up better than might be looked for, under the agitation of lower duties.

Iron ore imports were the smallest in any month in years—8,935 tons, against 55,993 tons in February, 1893. The value was $12,328, or $1.38 per ton, as compared with $1.67 per ton as the average valuation on the ore imported in February, 1893.

THE speech of Senator Hill on Monday—the event of the tariff debate—is the strongest evidence yet developed that the defeat of the Wilson bill is not only possible but probable. Senator Hill's declaration that his State is implacably opposed to an income tax, and his characterization of that species of taxation and of the Executive's hand in putting it in the bill, are undoubtedly born of the knowledge that sufficient votes can be mustered to eliminate that feature from the bill. This accomplished, the measure falls of its own weight, becoming merely a series of schedules to increase the aggregate of Treasury deficiency. Confident predictions are still out of place, but when all the circumstances of the speech of Monday are taken into account, it may be considered as all but tantamount to a prophecy of the tariff bill's rout. Should that be the outcome, the people may be depended upon before the second session of the present Congress, to register a verdict that will not make it necessary for statesmen any longer to quibble over interpretations of the National result in 1892. A fresh, up-to-date opinion, rendered in the light of events immediately past might make further additions to the ranks of Senate recalcitrants and save the country from any assault on the same line next year.

GENERAL MARKET RESUME.—Continued.

the lowest notch in price, forgetting sometimes the individual merit of the several productions under consideration. The railroads centering here have finally reduced their outbound rates, so that we are now on a par with Cleveland rates. This is a long needed step in the right direction. The present low prices of Southern foundry irons are attracting buyers of the most conservative kind, some of whom, both here and at points through the State, have covered their wants for the balance of the year. This is good evidence of confidence in the future."

Louisville. There are inquiries for considerable iron, parties desiring to take advantage of the present low prices, and where furnaces are willing to give up the advantage arising from the reduction in rates and sell at present low prices for long delivery, considerable tonnage will be placed. That prices are considered very low by buyers is evident from the fact that consumers who have already purchased quite freely at higher prices are now in the market again for large amounts, as they wish to reduce the cost of their present mixture by additional purchase of iron at the low prices now ruling. There is also a disposition on the part of investors to purchase iron as an investment, regarding the prices as low and the security offered as unusually safe. While the increase in business is not what was hoped for by consumers, this has not deterred them from buying as they feel the outlook is more promising and that they can regard present prices of iron as an investment even if they have no use for present purchases in the immediate future. Car shops are yet idle and it is not known when they will start up. Pipe companies report considerable business, but contracts are taken at figures without profit.

Cincinnati. The week in pig iron has been an interesting and rather eventful one. The most noticeable features are, first, the increased disposition to place round orders since the heavy freight reductions; second, the slow but steady increase of demand; third, the labor troubles, which for a time threatened shortage of coke supply, and also those in Chicago and elsewhere, which have tended to check improvement in the building trades. In regard to the increased demand stimulated by lower freights, it has shown itself in a very uneven way. Some of the most experienced of the large buyers have recognized that the time which they have been waiting for to get in at the bottom is now here, and they have placed contracts for full requirements running as far ahead as possible. The furnaces have been unwilling to guarantee

present freight rates on long contracts, but in most cases compromise figures have been reached satisfactory to both parties. The increased consumption is so uneven as to lead many to doubt that there is an improvement. Beyond doubt the melt of iron is steadily increasing. It will necessarily be so even if there is no improvement in general business, for stocks of all kinds of castings and finished material are exhausted. Another sufficient proof is that the steady increase in production of pig iron is fully absorbed and stocks are apparently declining instead of increasing. The largest producer of Southern iron has about 150,000 tons forward orders on its books, and last week shipped 1,000 tons more than current make.

Philadelphia

The iron market has shown considerable activity this week. The low rates on pig iron from Pittsburg and points west of Pittsburg have induced many consumers to make purchases that they otherwise would not consider. It is a significant fact that when the iron and steel market is in a depressed condition, Pittsburg producers make the loudest complaint although the volume of business shows that they get the lion's share; for instance, 24 out of 26 furnaces in Allegheny County are in active operation. It is thought that the rates now in effect will soon be withdrawn.

Publications Received.

Parts 1 and 2 of "The Book of the Fair" are a fitting introduction, in matter, illustration and treatment, to the great subject to which this superb review of the Columbian Exposition is devoted. After two pages of preface, unfolding the scope of the work, Part 1 enters upon a sketch, well illustrated, of the various world and national fairs of the century. Bird's-eye views of buildings and grounds show how magnificently the Chicago fair towers above any previous conception. The part ends with some characteristic views of Chicago and a sketch of its latter-day history. Part 2 brings the reader fairly into the glories of Jackson Park. The preliminaries of the Exposition, the selection of the site, the choice of the chief artificers and all the formative work that, even as it progressed, gave little hint of the wonderful outcome—all these phases are developed with the help of picture and word portraiture. If the Fair was a dream of beauty, "The Book of the Fair" is a perfect poem. Certainly the book-maker's art has never had a greater triumph. The Bancroft Co., Auditorium Building, Chicago, are the publishers.

From Wm. Thurstone, the secretary, we have the annual report of the Buffalo Merchants' Exchange, with statistics of the trade and commerce of Buffalo for 1893. It is full of details, measuring the commercial activity of Buffalo in the past year and indicating its prominence as a factor in the water transportation of the country. The aggregate receipts of flour and grain, reducing the flour to bushels of grain, were 164,459,720 bushels in 1891, 181,769,690 bushels in 1892 and 188,730,370 bushels in 1893, showing an increase in this commodity, in spite of the panic. The railroad yard facilities of Buffalo are said to be the greatest in the world. Within an area of 42 square miles, including yards adjoining the city limits on the east, there are 450 miles of tracks, and this will be increased to 660 miles when additions now planned are completed. The railroads own over 3,600 acres of land. The whole report bears testimony to the effective and painstaking labors of Secretary Thurstone.

"The Coal Trade," the annual publication of Frederick E. Saward, editor of the *Coal Trade Journal*, bound in red, as its twenty predecessors have been, is before us. It contains statistics as to coal production, prices, transportation, etc., for 1893, and is a compendium of information about the industry which the *Coal Trade Journal* represents with such thoroughness and fidelity.

The Avery Stamping Co., of Cleveland, have issued a 50-page booklet, with illustrations and descriptions of their specialties, which include steel hollow-ware, gas and air tanks for high pressure, seamless elevator buckets, mill tote boxes, foundry ladles, pipe hook plates, steel washers, presses, dies, seamless tubes and cylinders.

AMONG THE IRON MINES.

The Volunteer mine on the Marquette range was closed down last week and the pumps pulled, throwing nearly 200 men out of employment. The operation of the Volunteer the past winter has been out of consideration for the employes, as there has been practically no market outlook and the company has upwards of 120,000 tons in stockpile and on Lake Erie docks.

The Champion has put a force of men at work sorting ore on its stockpiles with a view to shipping a portion of it, though sales have not been made as yet.

All the work now in progress on the Mesabi range is on a basis of $1 a day for laborers.

The Drake & Stratton Co. will resume stripping operations in a few days at the Mesabi Mountain, with 150 men.

The name of the Iron King mine has been changed to the Auburn. Winston Bros. are making good progress with the stripping and Supt. Wallace is busy sinking a shaft. This property, as well as the Norman, will be worked by the milling process, the plan so successfully pursuee by the Duluth Ore company. Grading on the spur to the Auburn is well along and the mine will be in shape to make a good record as a shipper this season.—[Mesabi Range.

At the Canton mine, on the Mesabi, 1,090 tons of ore were raised in 20 hours on a recent day.

At the coming annual meeting of the Biwabik Iron Co., it is probable that some changes will be made in the directory, giving representation to the interests which have recently acquired portions of the stock.

A meeting of the bondholders and stockholders of the Penokee and Gogebic Consolidated mines was held at New York, March 27. A committee was appointed to perfect a plan of reorganization and to acquire the properties of the company after foreclosure proceedings have been carried out. It is expected that all this will require until mid-Summer for its accomplishment. Meantime nothing can be done about resuming at the mines. About $200,000 worth of receivers' certificates have been issued.

The machinery and material at the Dunn mine are to be sold at public auction April 16, to satisfy judgment liens on labor claims, amounting to $7,778.70. There are $22,000 unpaid royalties charged against the York Iron Co.

The Connellsville Coke Situation.

As intimated last week, the lawlessness attending the Connellsville coke strike was too open and precipitate to be long continued. The murder of Supt. Paddock aroused the authorities to the gravity of the situation and deputies were massed in sufficient numbers to overawe the lawbreakers. The strike was thus speedily broken, and in the north of the region all plants were in operation this week, while in the south districts there were several resumptions, with the force of workers gradually increasing.

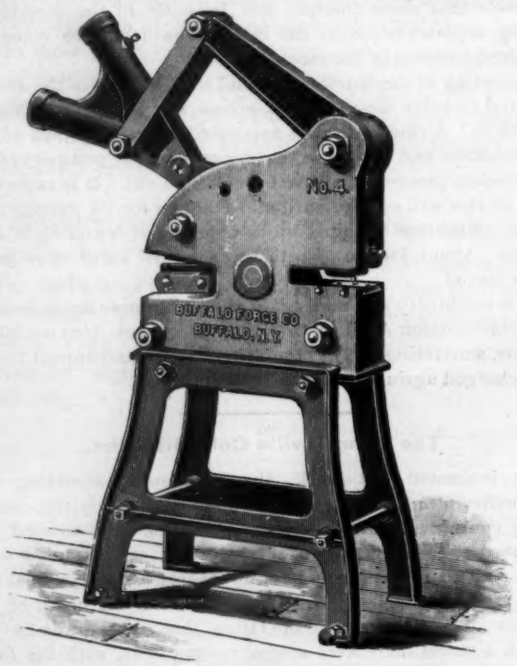
The delegate convention at Scottdale, Tuesday, at which 33 delegates were present, but with the north end of the region practically unrepresented, passed resolutions renewing the demand for a scale based on 90 cents per 100 bushels for mining, and ordering the continuance of the strike. There is no doubt that the unrest and agitation for better pay will go on, at least at such works as are not paying the 78-cent rate fixed by the Frick scale. From the beginning the majority of the Frick Coke Co.'s employes have preferred to remain at work. At other plants, in spite of the sweeping contrary statements in the daily dispatches, there have been many men who preferred even the low wages they were getting to idleness and lawlessness.

In the week ending March 21, just before the strike, there were produced 107,101 tons of coke in the Connellsville region, and shipments were 6,030 cars, or 130 cars more than in the preceding week. There were 10,866 ovens active in the week and 6,647 ovens idle. The strike caused a temporary curtailment of 25 to 30 per cent. of production. A few blast furnaces were compelled to bank, but the suspension was brief. It is to be expected that the struggle will be kept up by the workmen and that eventually all operators not paying the equivalent of the Frick scale will come to that basis. There is no immediate prospect of an advance in prices.

BLACKSMITH'S PUNCH AND SHEAR.

Four years ago the Buffalo combined punch, shear and bar cutter was first placed upon the market. Before being offered for sale, severe tests were made for over three years in various shops where the capacities of the different sizes could be thoroughly established, as well as the inventor's claim for durability. It is a convenient tool and there is scarcely a manufacturing establishment in which it is not needed. En route for the World's Fair, several English gentlemen, in visiting the works of the Buffalo Forge Co., took occasion to test the tool in operation themselves, and were astonished at the ease with which the work was performed. The designer has combined in one, the functions of three different machines—punch, shear and bar cutter. The construction is such that the operator can use it without a helper for heaviest work. No adjusting is required in changing the work, the machine being always ready for performing any of the three duties.

The mechanism is unique. It consists, as will be seen, in a combination of levers, so arranged that the cutting is done up from the bottom. One man, with this tool, is able to do a greater amount of work easier than two men using a down cut machine, where the pressure comes against a dead weight. The manufacturers do not recommend any of the sizes for work not listed as their capacity. All the working parts are made of the best material to templates. This tool has been improved in design since first being introduced, and the accompanying cut illustrates the latest form of construction. Its principal uses are cutting round iron, slitting iron, cutting flat iron and punching iron. The machine is built in four sizes with the following capacities: Capacity No. 1 will shear ¼″ strap iron 1½″ wide, will punch ⅛″ in ⅛″ iron, and cut off ⅜″. Capacity No. 2, will shear ½″ strap iron 2″ wide, will punch ¼″ in ¼″ iron, and cut off ¾″. Capacity No. 3, will shear ⅛″ strap iron 3″ wide, will punch ⅜″ in ⅜″ iron, and cut off 1″. Capacity No. 4, will shear ⅝″ strap iron 3″ wide, will punch ½″ in ½″ iron, and cut off 1¼″. The Buffalo Forge Co., of Buffalo, N. Y., manufacturers of the combined tool, also build a continuous shear for tinners and sheet iron workers, and an independent hand punch, the mechanical movements of the working parts being substantially the same in each case.



BLACKSMITH'S PUNCH, SHEAR AND BAR CUTTER.

THE Lodge & Davis Machine Tool Co., of Cincinnati, have just received from the Butte, Anaconda & Pacific Railway Co. an order for a complete outfit of machine tools, to be used in their shops at Anaconda, Mont.

EMPLOYERS of labor in Chicago building trades have locked out 75,000 employes.

TIN PLATE PROGRESS UNDER DIFFICULTIES.

The best promise of the permanency of the tinned plate industry in the United States is the number of new enterprises that have been started or projected since Jan. 1. In fact, no branch of the iron and steel industry has made so much progress during the past year, and this in spite of the fact that no single branch of industry has been subjected to so much hostility by legislators at Washington, who are engaged in an effort to upset all industry and to embarrass the starting of new industries. Whether production has increased or diminished is difficult to determine in the absence of statistics furnished by manufacturers, no official returns having been published by the Treasury Department for six months, but the fact that a number of new plants have been started, and most of those in existence last year have been in operation with comparatively little cessation, combined with the statistics showing greatly diminished importations, is presumptive evidence that the output has not fallen off, as compared with the first six months of 1893.

The moral of this is what *Tin and Terne* has always maintained, viz.: that whether the tariff be reduced or let alone the tinned plate industry will go forward, and that the costs of production will be reduced as exigencies seem to demand. This does not mean that wages will be made to bear all the diminution of cost; new methods and devices by which a greater production will be made possible at a minimum cost will help to reduce the cost, and, while wages will average lower, there is little probability that British wage rates will prevail.—[Tin and Terne.

Personal.

Mr. H. O. Crane, of the Irondale Steel & Iron Co., Anderson, Ind., called at the Chicago office of *The Iron Trade Review* last week. Mr. Crane said that the new works of his company, now in course of construction at Middletown, Ind., will be finished and running by the first of July.

Mr. George O. Manchester, formerly of the Atchison, Topeka & Santa Fe, has been elected vice president and treasurer of the Sargent Co., iron and steel founders, Chicago.

Wilson C. Berger, superintendent of the Berger Mfg. Co., of Canton, O., died at his home in Canton, April 2, 1894, aged 43. Mr. Berger and his brother John A. Berger formed the Berger Mfg. Co. in 1886, and its rapid advance to prominence in the iron roofing and sheet metal trades has been due to their industry and push, added to the long experience of the deceased in metal work and his inventive skill.

Messrs. F. T. Gates, General Manager Philbin, W. J. Olcott and J. B. Cotton, connected with the Lake Superior Consolidated Mines and its D. M. & N. Road, and Messrs. James Corrigan and Frank Rockefeller are among recent Mesabi range visitors.

Manager A. J. Moxham, of the Johnson Co., who will become a resident of Cleveland within the coming year, in view of the establishment of the company's offices in Cleveland and the building of its mammoth plant at Lorain, O., will respond to the toast "Greater Cleveland," at the annual banquet of the Chamber of Commerce, Tuesday evening, April 17.

Jacob James, formerly manager of the Arethusa Iron Works, of New Castle, Pa., has removed to Joliet, Ill, he and his brother having purchased a rolling mill at that place.

H. S. Fleming, formerly of the staff of the *Manufacturers' Record*, Baltimore, has become assistant editor of the *Engineering and Mining Journal*.

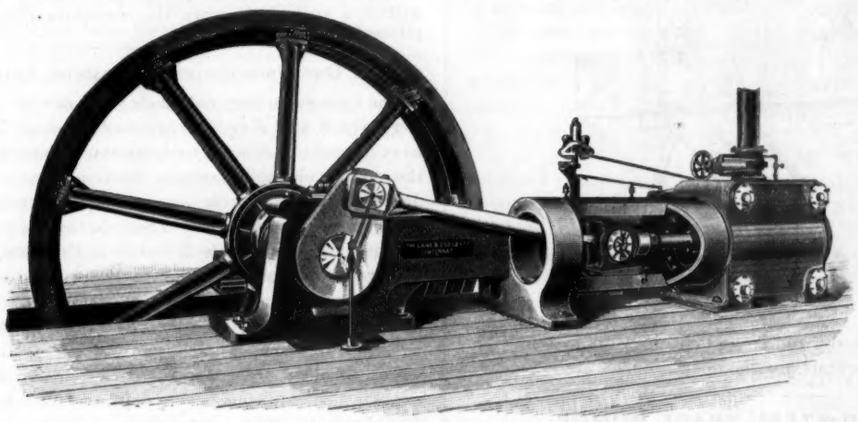
Mr. John A. Redfern, formerly with the Iron Cliffs Co., at Ishpeming, Mich., has been appointed superintendent of the Platt Mining Co.

Mr. A. E. Bronson, of Cleveland, will represent the Avery Stamping Co., of Cleveland, in the West, and Mr. M. S. Near, of New York, will represent them in the East. Both these gentlemen are so well known in the hardware trade that they hardly need an introduction.

A CORRESPONDENT suggests that there is a good opening for a foundry at Mt. Gilead, O. There is no foundry in that town and but one within a radius of 25 miles, and the business of one Mt. Gilead concern alone, it is said, would give a foundry more than enough to pay expenses.

LANE AND BODLEY CORLISS ENGINES.

In 1850, Mr. P. P. Lane started in the manufacture of steam engines and other machinery in a room 20x30, at No. 65 Pearl st., Cincinnati. He carried on the business until some time in 1851, when he formed a partnership with Mr. Joseph T. Bodley, under the name of Lane & Bodley. They then employed four or five men. Business increasing in the next few years more room was needed. In 1856 they moved to the southeast corner of John & Water streets, occupying a room 40x75, and in 1858 they purchased the tools of Reynolds, Kite & Tatum, who occupied the adjoining building. With more room and conveniences and tools, their business increased steadily, except in the period of the war. A stock company was formed in 1876, this being simply a change of partnership into corporate interests. The present buildings cover ground 147 feet on Water street and upwards of 400 feet on John street. When running their full capacity they give employment to 500 men. The company's specialties are Corliss engines, simple and compound. Some of the first of these engines were remarkable for rigidity and weight; they were so made to overcome the deficiencies in the lighter Corliss engines made in the East. From time to time improvements have been made on the first patterns, some new and very valuable features being introduced. The engines are made very strong to stand the severe strain in their use for electric light plants, water works, and other positions in which strong engines are needed. Making their own castings, the Lane & Bodley Co. use irons giving the greatest strength and durability. The castings are thoroughly examined to see that they are free from every flaw and imperfection. The same care which is given to making and inspecting castings is given to all other parts of the work. All other materials used are of a superior quality and pains are taken that the work shall be superior in every detail and that every part of the engine is finished in the highest style.



LANE AND BODLEY CORLISS ENGINE.

The illustration shows a new engine brought out last year, known as the 30x48 Columbian design Corliss engine. In this new design it is sought to produce a stiff and massive engine; observers of modern and high-class locomotives and machine tools will have seen the tendency to do away with all ornamental finish. This idea has been used in building this class of engines and at the same time there have been introduced valuable improvements. The girder has a cored-box section with a support under end of slide and the shaft bearing and pedestal cast with it. The slides are bored to a large radius with unusual size of bearing. The cylinder casting is made with rounded upper corners and enlarged steam chamber, having a cast iron top the full width of the cylinder. The port capacity is increased; the valve mechanism, governor and dash pot systems are the same as hitherto used. This company was the only one in Cincinnati to make an exhibit of engines at the World's Fair at Chicago last year. It consisted of a Columbian design cross compound engine, 31x42, a tandem compound engine, 29x42, and a Columbian Corliss engine. This exhibit aided much in making the Lane & Bodley Co. better known in this and in foreign countries, resulting both in inquiries and orders.

In connection with the manufacture of engines the company have for many years made a specialty of shafting, hangers and pulleys, in which they have a large trade. They also have a department devoted to the manufacture of saw-mill machinery and another to the manufacture of elevators. They have had a very large foreign trade which is increasing all the time.

While the business last year was affected by the general depression existing, their sales of Corliss engines were 50 per cent. more than in 1892. Among their patrons are some of the largest manufacturers in the country, as well as electric light, water works and street railroad companies. Among late orders received is one for an engine, boiler and appliances for an electric light and power plant in Princeton, Ind. Another is for an engine for a cotton mill in Straitsville, N. C., and they have an order for a chlorinating furnace from an Arizona point.

The officers of the company are H. M. Lane, president, and Charles F. Thompson, secretary and treasurer, both of whom have had an extensive practical experience in the business. Much of its success has been through their untiring enterprise and energy. Mr. P. P. Lane has retired from active participation in the business. Mr. Joseph T. Bodley died some years ago.

The Conflict Between Iron and Sinews.

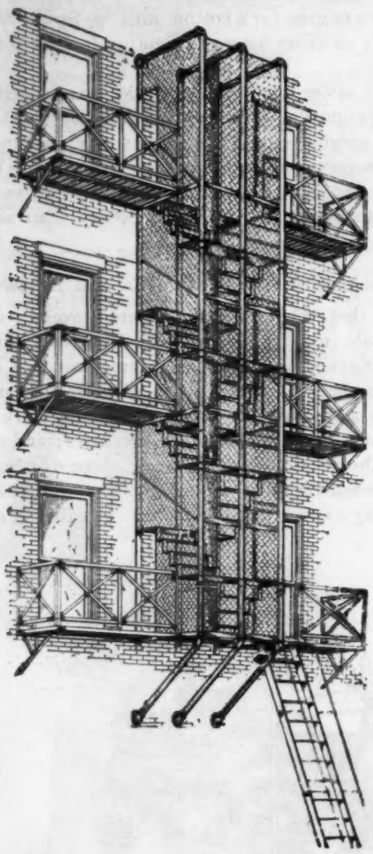
We learn that the 11 electric power traveling cranes recently put into use by the Yale & Towne Mfg. Co., in the yards of the Carnegie Steel Co., at Homestead, are displacing so large a number of laborers as to give rise to general comment. Fifty men, formerly occupied on the work now done by these cranes, have left for other localities; and it is stated on other authority that the first crane alone displaced over 30 men. And when these 50 men reach the "other localities," what may they expect to find there? Possibly 11 other electric power traveling cranes, displacing 50 other men. At first sight it seems difficult to reconcile the well-known zeal of our great manufacturers for the welfare of the American workingman with the pride which those same manufacturers take in the production of machines which turn so and so many men out of employment and set them looking for other localities, like vermin driven from their nests. Yet, in the long run, the gain to the workingmen may be greater than the immediate loss, for, however perfect our "labor-saving" devices may be, they yet require labor for their production. The substitution of the railroad for the stage-coach, enabling a given number of passengers to be handled by a much smaller force of men, has hardly resulted in a contraction of the labor market.—[Journal of the Association of Engineering Societies.

MESSRS. CURTIS & CURTIS, of Bridgeport, Conn., manufacturers of the Forbes patent die stocks, and all kinds of pipe working tools and machinery, find that their labor-saving machinery and tools are coming into such general use abroad, that they have decided to send out one of their firm to consult with their agencies scattered throughout Europe. Mr. Lewis B. Curtis expects to sail on May 16, and will be absent about three months. The firm are running their works with a full force, and are busy with foreign and domestic orders.

EXPORTS of pig iron from the United States in February were 845 tons, against 1,082 tons in February, 1893.

THE FAIRCHILD FIRE-ESCAPE.

The illustration in this connection is of the Fairchild fire-escape, patented last July, of which J. E. Bolles & Co., of Detroit, Mich., are manufacturers. The main escape is 3 feet 10 inches square, and always placed on a blank wall between windows. It is a continuous light iron staircase to the bottom, so that a crowd can go down without danger of being pushed off. The light iron ladder at the bottom can be drawn up out of reach and lowered by means of weights and pulleys. The great capacity of this escape adapts it to buildings where many



persons, and particularly women and children, are assembled—school buildings, hospitals, hotels, opera houses, etc.

IRON AND STEEL TRADE HUMOR.

There is no humor in the iron and steel and metal trades, these days, except what is to be found outside of them—if we may be pardoned the Hibernianism. But now and then one encounters a commentary upon some phase of the iron industry that can hardly be assigned to any other department of literature. The tariff debate in newspapers and in Congress has brought out many statements that it is difficult to believe were made in sober earnest. In the Utica, N. Y., *Observer* of April 5 we find an editorial that, while evidently written in all seriousness, will scarcely find that sort of response from readers of this paper. We give it space as an apt illustration of the length to which the editorial monopoly-crusher can go, when his fancy is entirely untrammeled by any suggestion of fact:

ONE GREAT MONOPOLY DOOMED.

The expected change in the iron and steel industries of this country, and we may safely say of the entire world, is now in actual progress, and at a rate which promises a speedy accomplishment.

It was several years ago ascertained that the ores of the Cleveland mines—in England—as well as those produced in the vicinity of Pittsburg, Pa., could not through any process of desulphurization be converted into the best quality of armor plate or Bessemer bars and rails. Twenty years ago the only thoroughly successful steel works in this country, situated at Clifton, in St. Lawrence county, were destroyed by fire, and no efficient attempt has since been made to re-establish them.

Carnegie and others have tried various devices, but up to this date with only partial success. Ore suitable for the production of Bessemer steel was found in Alabama, and Bessemer steel works were established there; but by some means the steel works company was bankrupted, and the Alabama product has since been confined to iron. Pittsburg may have obtained pig iron from there, but the most remarkable expedient resorted to for saving the Pittsburg works from ruin was that of transporting iron ore from the Benson mine, near Clifton, all the way to Pittsburg by rail, to be there converted into steel, not by the use of charcoal, as it was done in St. Lawrence county, but by means of bituminous coal.

But at length it transpires that all the efforts of capitalists to maintain their old monopolies are failing. At Cleveland, O., where for many years all the efforts to build up steel works have been indifferently successful, a change is taking place. The large plant of the Johnstown, Pa., iron and steel works is to be removed to Cleveland, to which point a superior quality of iron ore can be transported by water all the way from mines situated in Ontario, near the north shore of Lake Erie, without transhipment, which was impossible at Johnstown, to which canal boats only could have access. The lowering of duties under the Wilson Tariff bill completes the triumph of competition over monopoly in this instance. Another wonder is coming to light in the shape of the transportation of pig iron from Northern Alabama to the Gulf of Mexico by rail, and thence by sea around the Cape of East Florida to Liverpool, to be converted in the English works into Bessemer steel bars, rails and armor plates, thus supplanting all the British and even the Swedish raw material.

One more victory remains to make the revolution complete. It has been demonstrated that St. Lawrence County contains inexhaustable supplies of the purest iron ore in the world, with easy access to Montreal, and also to New York, with every facility for its cheap conversion into chain-cables, and all the varieties of steel known to modern science and skill, the only expense for transportation being that of the finished products, instead of the raw material, or the cumbrous pig, the manufacture of the last mentioned form being entirely dispensed with. The St. Lawrence County ores are at the earth's surface or in ridges above its common level, and the distance from there to England is only a trifle over 2,000 miles.

He must be blind indeed who cannot see that the revolution in the iron and steel industries is certainly assured, and that within a very few years its consummation will be accomplished.

Coal Consumption and Industrial Activity in 1893.

The figures on the coal production of the United States for 1893, which the *Engineering and Mining Journal* published, have caused considerable discussion among those engaged in the coal trade and business men in general. The fact that during a year of such general depression there should have been an increase of nearly 2,000,000 tons in the coal consumption is most remarkable in itself; in the face of a decrease in the production of nearly all staples in this country it is made still more prominent. The production in 1892 was 180,399,017 net tons, and in 1893, as ascertained by the *Journal*, 183,422,710 net tons, showing an increase of 3,023,693 tons. Our imports were 1,241,028 tons, but little less than in 1892, and our exports 4,098,843 tons, an increase of 1,100,939 tons over 1892. As there is but little variation in the stocks of coal, they are considered to be the same at the end as at the beginning of the year, and consequently the amount actually consumed in this country was 180,565,795 net tons, or 1,881,943 tons more than in 1892. It is apparent from this fact that the depression in business through the year could not have been so great in fact as it appeared on the surface. During the first half of the year business men worried over and continually talked about the depression in trade, when in fact they meant in prices. The continual talk about hard times caused capital to become far more conservative than there was any real reason for and thus affected other branches of business. The semi-panic spread everywhere and caused infinite harm to many industries, but, as the figures of coal production show, manufacturing interests throughout the country certainly have not suffered to the extent claimed and believed.—[Engineering and Mining Journal.

Puddled Iron in Great Britain.

The production of puddled iron in Great Britain in 1893 was 1,363,974 tons, compared with 1,560,697 tons in 1892 and 1,733,902 tons in 1891. In 1882, when British iron production reached high water mark, the output of puddled bars was 2,848,000 tons, showing that there has been a decline of over 50 per cent. in the 11 years. The production of Bessemer and open hearth steel ingots in 1882 was 2,109,000 tons; last year it was 2,893,000 tons. Thus of the total of puddled iron and Bessemer ingots, the former constituted 57 per cent. in 1882, but only 30 per cent. in 1893. The passing of the British puddler is slow, yet he is surely passing.

MACHINE SHOP AND FOUNDRY.

FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on the evening of Wednesday, April 4. President Schumann occupied the chair.

Secretary Evans read the report of the executive committee, which announced that the committee was well pleased with the condition of the association, and added that the recent discussions on matters of interest to foundrymen, in which the association had engaged, had been productive of much good.

Mr. Whitney, representing the car wheel section, reported prices about the same. Mr. Brown, of the committee on sash weights, reported prices very low. Mr. R. A. Register, of the soil pipe section, reported: "Still full, and prices a shade lower." Mr. Flagg, of the committee on small grey iron castings, noted "a trifle more business."

Mr. P. D. Wanner, representing the cast iron pipe section, said: "Prices were low in December, they became lower still in January, kept going down in February and March, and April brings little prospect of better things. We have been experiencing terrible times, for which we are ourselves in a great measure responsible. A great deal of animosity has been shown by Congress in the speeches against the manufacturers of the country. Members have said a great many things that are not true, and have displayed much venom. Now, if we would only stick together, instead of losing money and time, we might reverse the condition of things. We might say, 'We have been losing money, but now we are going to fix a time to stop.' That would bring about a crisis in ten days which would make or defeat the bill they are now trying to frame. A movement started here, I think, would have weight. We might give Congress until May 1 to settle this tariff question, and then let them shoulder the responsibility."

The Treasurer reported a balance in the treasury of $282.38. Mr. Evans then announced that Mr. W. J. Keep, of Detroit, had presented another paper embodying his replies to the arguments of several chemists on the subject of foundry tests. This paper, Mr Evans said, would be the last Mr. Keep would submit for some time to come. As it was very long it was merely read by title, and Mr. Evans suggested that its consideration be postponed until the next meeting. Through the kindness of *The Iron Trade Review*, he had been supplied with advance proofs of the paper in sufficient numbers to permit each member to take a copy home for perusal at his leisure. [The paper will be found elsewhere in this issue.—Ed.]

Mr. T. T. Morrell, formerly chemist of the Cambria Iron Co., read a paper upon open hearth furnaces.

He was followed by Mr. C. E. Buzby, Superintendent of the Riehle Testing Machine Co., who read the following paper on "Machine Tests":

"The great value of the testing machine, not only in the iron foundry but in all classes of structural manufacture, is to be found in the substitution of real for theoretical values. In most formulæ used by engineers a value is assumed for the material in question, sometimes based on very vague data, and varying perhaps several thousand pounds from the weakest to the strongest. In this case an average is generally selected which will bring the result somewhere within reason. When this result is combined with a factor of safety, we are still in doubt as to whether the result involves an excessive or inadequate factor.

"Judging from the price at which some castings are now delivered, we might readily expect that the average calculation would be far in excess of the real strength and in fact involve a doubt as to whether the product is mainly iron or cinder. How much better to deal with accurate figures, test the actual strength of castings from each heat, by using specimens of a reasonable size, and secure a known value for your product independent of hearsay and text-books. The growth of this tendency toward accurate, positive results is very marked, particularly among the iron foundries.

"The transverse test, combining the load with the deflection, has generally been selected as the ordinary standard. This is no doubt owing to the cheapness of the machine, and perhaps to the fact that cast iron is so much used for frame work and subjected to transverse strains, while the tensile strains are allotted if possible to rods and bolts. The tensile strength of a bar of one inch square of cross section being eight to ten times that of a one inch square bar tested transversely one foot between supports, involves a machine of eight to ten times the capacity and consequent increased expense, for which manufacturers working on close margins of profit hesitate to pay.

"The tensile tests are nevertheless valuable, and numbers of them are sent to our laboratory for test on our regular high capacity tensile machines. For this class of work the form of the specimen becomes a matter of vital importance, as it becomes almost impossible to avoid a combined transverse strain owing to the irregularity in the outline of the specimen.

The form of specimen which accomplishes this purpose is of circular section throughout, has about three inches straight in the centre of say 1⅛ inchs diameter, or 1 square inch area tapering outwardly toward the ends, the largest diameter being reached about 1¼ inches from the end, from which point it is slightly reduced, the largest diameter being say 1⅝ inches, or in ratio of at least 2 to 1, as compared with the centre. The outline of the specimen at the largest diameter is a curve of large radius, so that the first bite of the grip is at a tangent point which insures its being pulled into the direct line of stress, and as the stress increases, the length of hold gradually increases until sufficient to break the specimen. When these specimens are made in a properly matched flask we have always found them satisfactory in results. The large diameter should not be too near the end, or the curve radius too small, or the end will crush off before the center pulls apart.

"A square bar is invariably curved more or less, and irregularities along the sides or edges are apt to give cross strains, which reduce the value of the material. In the transverse machine the bars are rectangular, and may be 1 inch square, 2 in. x 1 in., etc., and lengths of 1 foot, 2 feet or 4 feet, according to specifications furnished by different departments. Ordinary comparative tests in the foundry are made to show, first, the actual strength of the iron made; second, whether the iron is keeping up to standard; and third, whether cheaper mixtures will give satisfactory results as to strength and flexibility if they are otherwise sufficiently soft and workable. Most founders know the effect of excess of different ingredients, and the testing machine is a valuable check in experimenting with mixtures varying their chemical properties."

At the conclusion of this paper, Secretary Evans invited discussion, and Mr. Flagg asked: "How do the tests on two reliable machines compare?" Mr. Buzby: "They ought to be identical."

Secretary Evans then announced that a question box had been started that members wishing to ask questions, and still remain "incog," might do so. One of the questions he had been asked to present to the association was this: "How long can iron be held in the cupola after the blast is on?"

President Schumann: "I suppose that means when the blast is on and the fan breaks."

Mr. Glover: "On one occasion I had 45,000 pounds in the cupola when the fan broke. I drained out all I could, took out the breast, banked it up and put a cover on. We were wrecked in the afternoon, and the next morning at 7 o'clock, about 14 hours later, we had started again. I have repeatedly kept my furnace open from an hour to an hour and a half, but we were then using hard coal and not coke."

Mr. Evans: "Another question from the question box is: 'Does foundry coke improve or is it impaired for cupola use if held under cover a year?'"

Mr. Glover: "I read that 300,000 tons are stored at one time at the Homestead works. That would seem to prove that at least it is not impaired by being stored for a time."

Mr. Evans: "Question three is, 'How would open hearth practice work for gray iron, and what effect would it have in improving low grades and slack?'"

No one seemed to be able to answer this.

The Birmingham Iron Foundry had written propounding this question: "Are the crop ends of Bessemer steel rails as used in the mixture for casting rail rolls any better than tool steel scrap? If so why?"

Justice Cox, Jr.: "Rail ends will not bring as much money in the scrap market."

Mr. James: "In the rail ends the manganese is much higher than in tool scrap, and that has a tendency to whiten the iron."

Mr. Evans announced that a paper by Mr. W. B. Johnson, which was to have been read at the present meeting, would be held over until next month. The meeting then adjourned.

WESTERN FOUNDRYMEN'S ASSOCIATION.

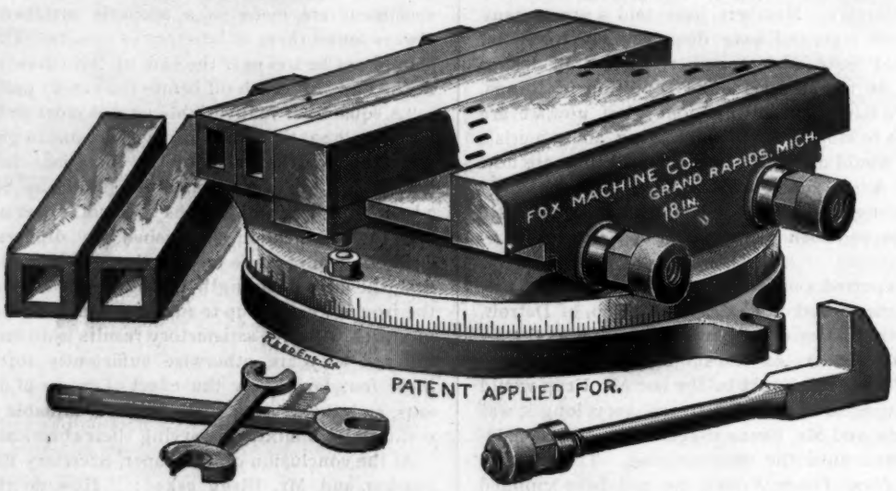
The next meeting of the Western Foundrymen's Association will take place on Wednesday, April 18th, at 7:30 p. m., in rooms 702-703, Temple Court Building, 225 Dearborn street, Chicago. A very important paper will be presented by Mr. Thos. D. West, entitled "Loss of Cast Iron in Remelting and Slagging."

All members of the Association are requested to be present, and to non-members a very cordial invitation is extended to be present and to take part in the discussion.

B. M. GARDNER, Secretary.

THE FOX PLANER CHUCK.

Particular stress is put by the manufacturers, upon the design and construction of the planer chuck illustrated on this page. The stationary jaw is always close to the operator, which means that the work is clamped there. It is thus not necessary to go to the other side of the chuck to tighten up the screws. The clamping screws are of steel, are solidly supported on the back and have a motion of two inches. The nuts are of steel knurled on the front end. There is no opening in the bed of the chuck and hence no lodgment of dirt and chips. Hollow parallels are furnished which fill in behind the sliding jaw. The base is graduated and can be swiveled and held at any angle.



THE FOX PLANER CHUCK.

Two sizes of this chuck are made: one 18-inch open and 10 inches wide, the other 12-inch open and seven inches wide. Strength is a quality specially emphasized, in that the clamping screws pull the chuck together instead of pushing it apart. The Fox Machine Co., Grand Rapids, Mich., are the manufacturers.

SHOP AND FOUNDRY NOTES.

Here is a good suggestion from *Foundry* which we hope the W. F. A. may act upon: "May 25th the Western Foundrymen's Association will be a year old, and as its first annual meeting will be in order just about that time, *The Foundry* would suggest that it make the occasion a memorable one and send a special invitation to all its members to make an extra effort to be present at that gathering. It seems to us that instead of having a paper to discuss on some technical subject, that this meeting might be enlivened by a number of short addresses, and following the example of the Eastern Association, something in the way of a banquet should be in order to cheer and render more joyous an occasion that ought to be thoroughly appreciated in all its significance by foundrymen everywhere. If gone about with energy and in the proper way, it may also be the means of doing the association much good."

W. E. Lucas, president of a Spartanburg, S. C., foundry company, sends the *Manufacturers' Record*, of Baltimore, this query that will be interesting to Northern iron makers. We think Mr. Lucas will find no trouble in getting plenty of the iron he wants: "Our work is principally repairs of cotton mills, and we can find no pig iron that is suitable. It runs too hard. We have tried both Virginia and Alabama and also Tennessee irons, and none of them are exactly what is wanted. The castings sent out by some Northern textile shops work nearly as soft as cheese. If you can give us any information as to where we can get this class of iron, or any process by which we can make our Southern irons answer the purpose, you will greatly oblige us."

At the foundry of the Phœnix Iron Works at Ashtabula, O., last week a fire caused by an explosion did some damage. The workmen had poured a large pit casting for an anvil block to a steam hammer and the gas generated was greater than had been counted on. In its effort to escape through the aperture in the mould, it blew the liquid metal to the roof, which became a sheet of flames. None of the workmen were injured.

The statement made at the meeting of the Foundrymen's Association last week that the price of cast iron pipe was lower in February than in January, and lower in March than in February, while April had still developed record-breaking figures, is illustrated by the bids opened at Pittsburg last Friday. The bidders were the National Foundry & Pipe Works Pittsburg; the Addyston Pipe Co., Covington, Ky., and the McNeil Pipe Works, of Burlington, N. J. Last years' contract was at $21.60 a ton delivered. This year the Addyston Pipe Co., again took the contract, for 590 tons, but at $17.70 a ton. All sizes, from 4-inch to 24-inch are included. The bid of the National Pipe & Foundry Co. is not reported, but, while there was a sentiment in favor of giving the contract to a local firm, their price was too high to warrant this.

Steel for Boiler Tubes.

Steel is rapidly superseding iron for use in boiler work. Steel tubes are being made now by a German by punching the pipes from hot metal. The process is as follows: A bar of steel is placed in a matrix of sufficient strength, and having a hole the exact diameter of the tube; then, without allowing time for the steel to cool, a mandrel having a rounded end is forced lengthwise into the mass. In this way tubes nearly eight inches in diameter are produced, the pressure required to operate the mandrel being 180 tons. After the completion of these first operations, the bar, with its perforation, is subjected to a finishing treatment of drawing and re-drawing until the required thickness of the shell is reached.

THE John McVoy & Co. and the Midland Steel Co., both of Muncie, Ind., have recently appointed John H. Blood, 1141 Monadnock Block, Chicago, their agent for the sale of their galvanized and corrugated sheet iron and sheet steel in Chicago.

FOUNDRY MIXTURES CONTROLLED BY A MECHANICAL ANALYSIS.*

W. J. KEEP, DETROIT.

It seems that a chemist cannot give a formula for the chemical composition of a casting that shall have a specified strength, shrinkage and chill, unless he can first analyze a casting that has such physical qualities.—[Mr. Fry, at last meeting.

The expression, "a physical test," seems to be universally understood to mean a test for strength, using a test bar having one or more inches cross section. I have used this expression, not wishing, during this discussion, to speak of my special methods; but that what I say may be understood, I must describe them as briefly as I can.

"Keep's Test."—A test bar, very sensitive to change in both chemical and physical composition, one-half inch square and twelve inches long, is cast in green sand, along with a still more sensitive companion bar, one inch wide, one-tenth inch thick, and one foot long.

These bars are cast with their ends against chills 12⅛ inches apart. The distance that the ends of these test bars draw away from these chills, gives the shrinkage in thousandths of an inch per foot.

The foundry mixture is governed by this record of shrinkage, which tells whether there is enough or too much silicon in the casting. If the shrinkage is not as low as has been found best for such castings, increase the irons that are high in silicon; and if the shrinkage is too low, increase the low grade irons or scrap. This mechanical analysis takes into account the influence of all elements in the iron, for if carbon is low, it requires more silicon to produce a given effect, and vice versa. If any condition increases shrinkage, more silicon is needed to bring it down. What the founder wants to know, and to know it quick and sure, is whether he has the right amount of silicon in his casting. The shrinkage tells him at once. It also indicates hardness, for the two rise and fall together. By splitting the end of the square bar, the depth of chill is measured, which is an additional guide. The grain of the fracture of the test bar tells an intelligent foundryman whether a casting of a certain size will be spongy or too close. Four other ½-inch square bars are cast at the same time. These five square bars are broken in a special testing machine, which makes an autographic record of strength, deflection set and elasticity, and the average of these five is the record.

Relative Tests are those which are applicable to every case. The routine must be the same in all tests, and any test record of any iron or casting is greater or less than other tests by the same method. It is soon found what test record accompanies acceptable castings for any purpose, and this record at once becomes the standard record for such castings in that foundry, though it may not correspond to results obtained by others. Having determined what is the most satisfactory shrinkage for each grade of casting, the endeavor thereafter is to keep as close as possible to the standard.

The record of the sensitive half-inch test bar is the unit of measure for any mixture, the same as a foot rule is a measure for the smallest or greatest variation in size. Strength generally cannot be traced directly to chemical constitution, or to shrinkage, but is dependent on the mechanical structure of the metal, and the test of strength is to find if we have made a mixture that brings out the greatest strength.

Keep's Foundry Chemistry.—My reason for giving this name to my conclusions regarding the chemical elements found in cast iron, was to draw attention to the radical difference between them and the opinions of the average chemist, as stated in works on iron metallurgy. For twenty years I was a close student of metallurgical chemistry, in charge of foundry work, and failed to find a relation between the chemical composition and the strength of test bars of various shapes. Mr. Mumford had a similar experience.

When I hit on a half-inch test bar as a test for shrinkage, I found a solution of the whole question, and found that silicon, the controlling agent of the mixture, was indicated by shrinkage.

But no physical characteristic corresponded to either of the carbons, or to phosphorus, sulphur, or manganese. In 1885, Prof. Turner hit on the use of a series of test bars, with silicon the only variable. I at once applied the same method to all of the chemical elements, and found the exact influence of each when in cast iron. I found, also, that in the quantities usually found in pig iron, or in gray foundry castings, the influence of all but silicon was almost imperceptible, and that all but silicon, in ordinary practice, could be overlooked. In this light, each iron analysis is in perfect accord with physical tests of all kinds, and mystery and superstition are banished from iron mixture.

Proof of My Position.—As chemists either dislike, or are not familiar with my mechanical analysis, I will go back to laboratory methods for my proof. Within a few weeks, the Tennessee Coal, Iron & Railroad Co. have sent me a pig of each of the eleven grades of iron made at their furnaces, the same mixture of ores being in each pig. Each pig contained the hole from which their chemist, Dr. Phillips, took his drillings. I made a set of test bars from each, and the chemical and physical records are Series I.

Mr. A. J. Morse, now instructor in metallurgy in the School of Mines, Rapid City, S. D., sent me, about the same time, fourteen pigs, with the drilled holes in them. As he had completed the graphic carbons in only six, I make of these Series II.

Several years ago, a foundry on the Hudson River procured a complete analysis of the irons entering into their mixture, and of the castings, and sent the pigs and castings, with analyses, to me. These are Series III.

I have arranged all of the above irons in the order of their silicons.

Series IV is composed of tests of a single mixture of cupola iron, melted with coke, taken a week apart. Tests 788 and 791 were the very first and last iron taken from the cupola, to determine the influence of a cold and a hot cupola. Tests 780 and 782 were cast 1½ minutes apart, from one ladle, the iron being stirred with a steel bar between casts. Tests 784 and 787 were cast 2½ minutes apart, the iron being allowed to stand quietly between casts. The full test records can be seen in Series VII. The test bar 782 is the strong bar for which I challenged a prescription, and now that I have given the analysis, Mr. Fry can possibly tell what his prescription should be, but the same result can be obtained with almost any other composition, when the percentages of silicon, phosphorus, sulphur, and manganese are less. Series IV is produced to show all who have held a different opinion, that the physical qualities of a casting cannot be produced by a chemical formula alone, but that a test of the right kind will tell when the mixture is such as to produce the most desirable physical structure.

SERIES I.

CHEMICAL ANALYSIS.

No. Test.	Southern Pig Iron.	Total Carbon.	Graphitic Carbon.	Combined Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
731	No. 2 Silvery	1.51	0.58	0.93	4.91	0.58	0.08	0.25
730	" 1 "	2.17	1.60	0.57	4.70	0.59	0.06	0.27
728	" 1 Soft	2.94	2.11	0.83	3.65	0.60	0.06	0.27
729	" 2 "	2.81	2.00	0.81	3.24	0.76	0.05	0.21
721	" 1 Foundry	2.88	2.42	0.46	2.53	0.60	0.04	0.23
724	Foundry Forge	2.29	2.28	0.01	2.16	0.62	0.19	0.19
722	No. 2 Foundry	2.16	1.90	0.26	2.00	0.79	0.08	0.23
723	" 3 "	2.14	2.04	0.10	1.83	0.77	0.10	0.31
725	Grey Forge	1.79	1.51	0.28	1.74	0.70	0.17	0.38
726	Mottled	2.74	1.00	1.74	1.36	0.76	0.36	0.31
727	White	2.01	0.67	1.34	0.94	0.76	0.42	0.29

PHYSICAL ANALYSIS.

No. Test.	Southern Pig Iron.	Dead Load.		Impact.		Shrinkage.		Chill.
		St'gh	Def.	St'gh	Def.	Sq're	Flat.	
731	No. 2 Silvery	295	.24	305	.27	.140	.136	.01
730	" 1 "	360	.27	407	.32	.131	.138	.02
728	" 1 Soft	375	.27	407	.32	.149	.157	.04
729	" 2 "	293	.25	322	.32	.130	.154	.02
721	" 1 Foundry	384	.25	407	.30	.156	.145	.01
724	Foundry Forge	362	.20	305	.21	.164	.164	.15
722	No. 2 Foundry	365	.27	373	.30	.159	.161	.01
723	" 3 "	354	.19	254	.20	.161	.148	.30
725	Grey Forge	365	.23	356	.27	.160	.163	.0
726	Mottled	372	.11	186	.14	.226	.218	white
727	White	435	.13	237	.15	.240	.....	white

*Prepared for the meeting of the Foundrymen's Association, at Philadelphia, Wednesday, April 4, 1894.

SERIES II.

No. Test.	Name of Iron.	Total Carbon.	Graphitic Carbon.	Combined Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
715	Ensley, G. F.	3.14	2.21	0.93	2.62	0.88	.....	0.16
717	Summerlee No. 1	3.38	2.92	0.46	2.00	1.27	.....	1.67
713	Tuscarawas 2 F	3.62	3.18	0.44	1.93	0.70	.....	0.86
719	Sloss, G. F	3.37	2.85	0.52	1.77	0.56	.....	0.40
720	Napier No. 3	3.65	3.50	0.15	1.76	0.85	.....	0.48
710	Eureka 3 F	3.45	2.90	0.55	1.54	0.83	.....	0.23

No. Test.	Name of Iron.	Dead Load.		Impact.		Shrinkage.		Chill.
		St'gh	Def.	St'gh	Def.	Sq're	Flat.	
715	Ensley, G. F.	368	.20	339	.22	.185	.186	.25
717	Summerlee No. 1	377	.17	288	.18	.165	.185	.65
713	Tuscarawas 2 F	418	.24	390	.26	.154	.177	.30
719	Sloss, G. F	442	.22	407	.26	.164	.197	.....
720	Napier No. 3	423	.19	331	.21	.165	.199	.80
710	Eureka 3 F	443	.25	416	.27	.159	.163	.45

SERIES III.

No. Test.	Name of Iron.	Total Carbon.	Graphitic Carbon.	Combined Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
178	No. 1 Globe, Silvery	3.154	2.852	0.302	5.899	1.100	0.029	1.000
181	Alice, Silvery, Ala	2.963	2.742	0.221	4.853	0.597	0.010	0.199
179	No. 2 Franklin, N. Y.	3.179	3.064	0.115	3.014	1.433	0.007	0.168
176	" 1 Poughkeepsie	3.266	3.166	0.100	2.946	1.242	tr.	0.189
175	" 1 Bushong	3.343	2.879	0.464	1.932	1.089	0.013	0.136
177	" 2 Poughkeepsie	3.572	3.457	0.115	1.642	1.224	0.035	0.241
304	Casting	3.157	2.846	0.311	2.910	1.027	0.054	0.252
	Estimated in casting	3.214	2.927	0.287	3.031	1.070	0.025	0.248
Loss		0.057	0.081	.....	0.127	0.043	.....	.....
Gain		.....	.....	0.024	.....	.....	0.029	0.004

No. Test.	Name of Iron.	Dead Load.		Impact.		Shrinkage.		Chill.
		St'gh	Def.	St'gh	Def.	Sq're	Flat.	
178	No. 1 Globe, Silvery	297	.16	204	.....	.187	.170	.02
181	Alice, Silvery	325	.32	311	.....	.120	.160	.06
179	No. 2 Franklin	328	.21	282	.....	.137	.152	.10
176	" 1 Poughkeepsie	355	.25	333	.....	.134	.147	.12
175	" 1 Bushong	374	.23	327	.....	.152	.157	.18
177	" 2 Poughkeepsie	376	.22	282	.....	.148	.152	.20
304	Casting	383	23	339	.....	.124	.149	.10

Fuel, Cross Creek Anthracite Coal, carbon, 88.94; ash, 10.18; P., 0.075; S., 0.159.

The cupola charge was 1,800 pounds coal on bed; the charge of iron was 4,000 pounds, and of coal, 300 pounds, etc.; the melt was 16 tons, and they did not slag the cupola. (Each iron charge was 1,000 pounds Bushong, 250 pounds each 1 and 2 Poughkeepsie, 500 pounds each Alice and Franklin, 250 pounds Globe, and 1,250 pounds of remelt.)

SERIES IV.

No. Test.	Treatment.	All Tests from Same Mixture.	Total Carbon.	Graphitic Carbon.	Combined Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
788	Temp.	First of Heat	2.910	2.280	0.630	3.220	1.025	0.123	0.490
791	Test.	Last of Heat	2.950	2.470	0.480	3.140	1.055	0.100	0.470
780	Iron	1st Set } One	.....	.....	.....	3.520	.....	0.081	.....
782	Stirred.	3rd Set } Ladle	.....	.....	.....	3.520	.....	0.080	.....
784	Allowed	1st Set } One	.....	.....	.....	3.460	.....	0.079	.....
787	to Stand.	4th Set } Ladle	.....	.....	.....	3.459	.....	0.083	.....

No. Test.	Treatment.	All Tests from Same Mixture.	Dead Load.		Shrinkage.		Chill.
			Strength	Def.	Square.	Flat.	
788	Temp.	First of Heat	390	.22	.163	.182	.15
791	Test.	Last of Heat	400	.22	.121	.140	.07
780	Iron	1st Set } One	440	.23	.123	.139	.05
782	Stirred.	3rd Set } Ladle	530	.27	.131	.....	.02
784	Allowed	1st Set } One	400	.23	.128	.143	.02
787	to Stand.	4th Set } Ladle	500	.25	.128	.136	.02

To be certain that the determinations of Series IV were absolutely correct, we sent the iron to Messrs. Cary & Moore, of Chicago, asking them to make the analyses in triplicate. The analyses are of the same bars of which the physical record is given. The averages are given in Series VII to IX.

In examining these series, the records of the whole must be considered to draw conclusions.

Manganese.—These series do not indicate any influence from the presence of this metalloid, and I have proved in my paper, "Manganese in Cast Iron," (Transactions Am. Inst. Mining Engineers, vol. xx, p. 291, 1891), that it need not be feared when it is below 1 per cent. in the casting, and that it can be ignored. When above 1 per cent., it increases shrinkage and hardness, but it does not increase combined carbon. It does not turn iron white or increase a tendency to chill.

Phosphorus, in these series, gives no indication of any influence on the physical qualities of the iron. I have proved in my paper, "Phosphorus in Cast Iron," (Trans. A. I. M. E., vol. xviii, p. 450, 1889), that this metalloid in cast iron has no effect on carbon; that it decreases shrinkage, and adds some life to molten iron. It weakens cast iron when much over 1 per cent. American pig iron will rarely impart to castings more than this percentage, and for this reason it may be ignored.

Sulphur.—We now come to the element which many claim to be poison. We have high sulphur in five of the irons in Series I, but in these irons it has absolutely no influence on dead load strength. Perhaps it has a slight influence on impact strength. We might infer that it increased chill, but the grey forge, which is one of the highest in sulphur, and which is low in carbon, has absolutely no chill.

In Series IV, the iron mixture is the same in all. The chemical composition is the same in all (except 788), except that sulphur and silicon vary slightly. If any one claims that the small variation in sulphur has produced any physical change, they are met by tests 784 and 787, where the highest sulphur is in the latter, but with absolutely no physical variation, except for the better. The more sensitive flat test bar shows decreased shrinkage, and the strength is increased 25 per cent. In all of the irons of Series I and IV, the increase in sulphur and the change in physical character was due to a cold furnace or cupola. Test 788 was taken from the cupola when it first began to melt, and was comparatively cold. There was no slag to cover the iron, and the cold blast reached all parts, and gave the iron considerable chill, and allowed quite a percentage of carbon to remain combined, and gave the iron a high shrinkage. It was not the sulphur that did this, because 787, the last iron taken from the cupola, has also substantially the same sulphur, with the lowest shrinkage and less than half the chill. All that produced this change was the heat, for silicon is less in 787. On that day a sulphury car of coke was used. Sulphur is accompanied by slate, which means increased ash, that is deficient in heat producing power, and this caused the cupola to melt cold.

In Series I, it was probably some chilling influence in the furnace that gave the close grain to the foundry forge, and not low silicon, and this allowed sulphur to remain, and it also gave the iron a chill. The same was true of the No. 3 foundry. The gray forge got its close grain from a lack of carbon and low silicon. We have in this almost 0.2 per cent. sulphur, and absolutely no chill.

In my paper, "Sulphur in Cast Iron," (Engineering Congress, Chicago, 1893), I show that in tests where sulphur is higher than one-half of one per cent., chill is increased, but there is no indication anywhere that sulphur is in any way beneficial. To melt iron hot, the fuel should be reasonably free from sulphur. Pig iron with a good grain will be low in sulphur.

The amount of sulphur in gray iron castings made from merchantable pig iron will be so low in sulphur that it will exert no perceptible influence, and can be ignored. Chemists are very apt to blame sulphur for anything that is mysterious. One, at your last meeting, related that he told a New York founder that 1 per cent. of sulphur in his fuel had added 0.15 per cent. of sulphur to his casting, and that this had turned the iron white. The poor fuel melted cold, but he acknowledges that he did not know the carbon in the pig, and he does not seem to know that, if he had prescribed an increase of silicon, the castings would have been gray and soft. No analysis was necessary, for the white fracture indicated that silicon was needed. If sulphur should exert any influence, a slight increase of silicon would at once remove the influence.

I am told that for malleable iron castings, for chilled castings, especially where they are subjected to heat, very small percentages of sulphur will work damage. I do not know that from personal knowledge, and am pleased to make this statement, because in England it is feared that my position regarding sulphur in gray castings may encourage the use of sulphurous ores and fuel, (President Roberts' annual address,

South Staffordshire Institute of Iron and Steel Works Managers, 1894.) It will be noticed in Series III that the casting is high in sulphur, as compared with the pig irons and the fuel, but it has so low a shrinkage and chill as to prevent any claim that the sulphur has exerted any evil influence. The proof seems complete that it may safely be ignored.

Carbon is the most important element in cast iron. Without it, iron could not be melted and made into castings. The percentage of total carbon determines the melting point of the iron. Carbon in melted iron is always combined, and more can be retained by the iron when fluid than when cold. On cooling, any surplus separates out into graphite, and makes a gray casting. Total carbon, no doubt, exerts an influence on strength, but such is not marked in these series.

Combined Carbon, in these series, is not by any means a controlling element, as hardly any relation can be traced between it and the physical composition. Silicon will decrease it, but in any pig iron it is difficult to account for its presence, except on account of a lack of heat in the furnace.

Graphitic Carbon, in the series, does not correspond to any physical quality to an extent to attract attention. By its dividing the grains of metal, it softens carbonized iron; it also removes brittleness, and by the mechanical separation of the grain may cause weakness, but so many variations occur that the only way to be certain as to strength is by actual test. This form of carbon gives trouble in large castings, and those which must resist hydraulic pressure, by causing a spongy and open grain. It is sometimes difficult to obtain the requisite strength, closeness, lack of brittleness, softness, and low shrinkage. We do not get this knowledge from chemistry, but from practical experience. The eye, guided by common sense, will soon tell what grain is necessary to make castings fit for every purpose.

Silicon lessens the ability of iron to hold carbon in the combined state when cold; therefore, any increase of silicon will increase the graphitic carbon.

Silicon is of little use in cast iron, except as it acts on carbon. Its influence is not direct, but through its change in the carbon. The greater the quantity of carbon present, the greater will be the influence of silicon. Silicon is the controlling element, and is the only element that the founder need take account of, except to see that the iron contains sufficient carbon for the silicon to act upon. By silicons changing combined carbon into bulky graphite, the casting occupies more room than if the carbon remained combined. This is what lessens shrinkage. The more silicon, the more graphite, and the less shrinkage.

There can be no doubt about this, after the irons of these series are examined. As silicon grows less, shrinkage increases. In very high silicon iron, so much of the carbon is completely driven out that there is not sufficient left for the silicon to act upon to reduce shrinkage, and silicon of itself increases shrinkage.

The regulation of a foundry mixture by variation of silicon, shows the influence of silicon on carbon in varying shrinkage; for all other elements remain unchanged. In this case, a variation of silicon varies chill and strength to some extent, ("Silicon in Cast Iron," A. I. M. E., vol. xvii, p. 863, 1889.) Different kinds of castings require different percentages of silicon, which can be learned by the founder by a study of the shrinkage of a ½-inch test bar. The figures representing the percentage are of little account. What he wants to know is whether the casting contains the right amount.

Silicon is more effectual as found in some irons than in others. To illustrate this, we introduce Series V.

SERIES V.

No. Test.	Name of Iron.	Total Carbon.	Graphite.	Combined Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
441	F L M	3.550	3.220	0.33	1.249	0.080	0.040	0.190
525	No. 3 Ashland Silvery	3.333	3.124	0.209	4.700	1.543	0.044	0.963
794	No. 3 —— Silvery	1.210	1.160	0.05	4.410	.....	0.114	.....
793	441 and 525	Car.	not	mat.	lowd	2.50	Inc.	Same	.....
792	441 " 794	"	is	"	"	2.50	same	Inc.	.....

No. Test.	Name of Iron.	Dead Load. St'gh	Dead Load. Def.	Impact. St'gh	Impact. Def.	Shrinkage. Sq're	Shrinkage. Flat.	Chill.
441	F L M	362	.27	339	.29	.168	.186	.40
525	No. 3 Ashland Silvery	352	.15	145	.14	.156	.155	.50
794	No. 3 —— Silvery	260	.17	.....	.....	.184	.183	.01
793	441 and 525	378	.22	246	.19	.143	.156	.23
792	441 " 794	407	.25	399	.27	.190	.185	.15

F L M is a Swedish charcoal pig which I use in trying other irons. It is very sensitive to any outside influence. Ashland is a very close grained silvery iron. The No. 3 silvery (794) contained nearly the same silicon and had a similar close grain. For 793 and 792 enough of each of these silvery irons were added to F L M to make the silicon of the mixture 2.50 per cent. If only an analysis of silicon and combined carbon had been made it would be conceded that 794 was better than 525. It has high sulphur, but this does not seem to increase combined carbon. The phosphorus was about 0.80 per cent., while that of 525 was high. As a reducer of shrinkage 525 is perfect, but 794 increases shrinkage. As a reducer of chill 794 is better than 525. The inability of 794 to reduce shrinkage lay in its own lack of graphite. Total carbon in 792 is reduced so much that its shrinkage is greatly increased.

This proves positively that a silicon analysis, or silicon and combined carbon analysis, is not as safe a guide in the purchase of an iron as the shrinkage test, that is, a mechanical analysis.

Fracture and Silicon.—The irons of series I were selected by the face of the pig more than by fracture, and this is the furnace method of grading. These pigs were drilled and shipped to me at once before any determinations were made, but the analyses show that the surface grading was correct, and the fracture is such as to leave no question as to grade, and it also shows that the silicon is indicated by the fracture, except in the single case of foundry forge. It is a little remarkable that about the only thing that the chemical analysis of these pigs does show, is that the appearance of the pig indicates quality so far as silicon and carbon are concerned.

It is a fact beyond a question that of two irons having the same chemical composition, the one having the most open grain will make the best castings, because it was made at a higher temperature.

The Purchase of Pig Iron by Analysis would lead to more dissatisfaction than by fracture, because the openness of the grain is very important.

It would amount to a guarantee on the part of the furnace, and 50 cents per ton would be a small advance to cover expense and risk.

If a second analysis was made it would not agree with the first. It is never claimed that anything but silicon would be guaranteed, but total carbon is of as much importance as silicon.

If the founder knows enough about iron to know the approximate silicon by the fracture, he will be able to buy silicon cheaper by fracture, and if the iron happens to be deficient in silicon it is easily made up. For example, Alice of Series III was bought and delivered as No. 2 foundry, but proved to be the best silvery iron that could be bought. Even if silicon is the same in an open and in close grained iron, the close grained iron is most likely to be deficient in carbon, or to have been made at a low heat.

Physical Quality Independent of Chemical Constitution.—This is true to a great extent, as the following will prove. In Series VI from the same ladle of iron were poured two sets of test bars, one set (653) cast horizontal and the other (655) cast on end, being fed from the bottom. The test was repeated in 672 and 673.

SERIES VI.

No. Test.		Dead Load Strength.	Gain.	No. Test.		Dead Load Strength.	Gain.	Impact Strength.	Gain.
653	Horizontal	373	.....	672	Horizontal	383	.....	435	
655	On End	512	139	673	On End	438	55	526	91

No one would claim any difference in chemical constitution. In Series VII, I give 4 average tests to show the influence of

time and cooling after iron is caught in a ladle. Time allows particles of slag and gas to escape, and cooling causes a more compact grain.

SERIES VII.

No. Test.	28 lbs. Iron in one Ladle. (Rested).	Dead Load.		Impact.		Shrinkage.		Chill.
		St'g h	Def.	St'g h	Def.	Sq're	Flat.	
784	Poured on reaching floor..	388	.23	348	.24	.128	.143	.02
785	" 1 minute later.....	393	.21	331	.23	.128	.139	.02
786	" 1 " "	424	.21	406	.25	.128	.135	.02
787	" ⅝ " "	466	.24	347	.24	.128	.135	.02

The two sets of tests in Series VIII are exactly alike, but made some days apart. The ladle held 28 pounds of iron and on reaching the molder's floor a steel bar with the end about one inch in diameter, was introduced two inches below the surface, and with it the surface was stirred slowly for one-half minute. I took one-quarter minute to pour the three flasks of test bars. The surface was then stirred as before and so on. The metal was so cold that before the fourth pouring the surface was stirred very little. The metal was cooled more than in Series VII, and the agitation, no doubt, helped to remove slag and gas.

SERIES VIII.

No. Test.	28 lbs. of Iron. (Stirred).	Dead Load.		Impact.		Shrinkage.		Chill.
		St'g h	Def.	St'g h	Def.	Sq're	Flat.	
776	Poured on reaching floor..	403	.21	296	.22	.127	.140	.02
777	" ¾ minute later.....	463	.26	313	.....	.126	.137	.02
778	" ¾ " "	481	.26	423	.24	.127	.135	.02
779	" ½ " "	483	.26	304	.20	.127	.....	.01
780	Poured on reaching floor..	418	.22	399	.24	.123	.139	.05
781	" ¾ minute later.....	488	.27	458	.25	.128	.139	.04
782	" ¾ " "	508	.27	491	.26	.131	.....	.02
783	" ½ " "	.....	.....	.....	.....	.128	.....	.02

In Series IV, I gave analysis by Cary and Moore of one bar of the following tests: (784) Si. 3.46, S. 0.079; (787) Si. 3.45, S. 0.083; of test (780) Si. 3.52, S. 0.081; (782) Si. 3.52, S. 0.080. The analysis of the series 776–779 would have been substantially the same because the iron mixture was not changed. There is practically no variation in shrinkage and chill, and no variation in chemical composition, and yet there is a very great change in strength, which is due to two causes, the clearing of the metal from slag and gas on account of time, and the lessening of internal stress, because the first bars poured, formed a rigid shell around very hot metal. In cooling and crystalizing, each grain tended to pull away from those next to it. The bars of the last cast being colder, made a more solid casting with less internal stress. It is always customary to allow metal to become as cold as possible before pouring, so as to get the greatest strength.

SERIES IX.

No. Test.	Difference in Cupola Temperature.	Dead Load.		Impact.		Shrinkage.		Chill.
		St'g h	Def.	St'g h	Def.	Sq're	Flat.	
788	First iron from cupola.....	373	.21	263	.20	.162	.182	.15
789	1 hour later.....	369	.21	280	.21	.137	.147	.04
790	1 " "	367	.21	297	.22	.130	.141	.05
791	Last iron.....	398	.22	398	.25	.121	.140	.07
795	First iron.....	431	.22	373	.24	.158	.165	.08
796	1 hour later.....	429	.23	432	.27	.132	.144	.03
797	1 " "	448	.23	424	.26	.126	.140	.03
798	Last iron.....	396	.23	297	.22	.132	.144	.06
799	First iron.....	415	.23	373	.24	.159	.165	.07
800	1 hour later.....	453	.23	382	.24	.136	.148	.03
801	1 " "	455	.25	398	.26	.130	.141	.05
802	Last iron.....	477	.27	415	.25	.125	.140	.06

Getting metal which has been melted hot in a cupola, into a mold as cold as possible, must not be confounded with melting cold in a cupola. Of this latter I give three examples in Series IX.

The cold cupola, at the beginning of a heat, gives high shrinkage every time, and the shrinkage comes down as soon as the cupola is hot. A complete analysis of tests 788 and 791 was given in Series IV. The iron in this first experiment was poured as soon as the molder reached his floor. The cupola mixture of the last two was the same as in the first, but the molder used the first part of his iron for other work, and poured the test bars with the last iron in his ladle. The iron went into the molds of the first hot, and into the last two cold, and after some agitation in pouring the other work. In this way this series show the effect on strength, of manipulation, not in the least dependent on chemical constitution. These series show the exceeding sensitiveness of "Keep's Test," and what information it can give the founder.

Suggestions for using "Keep's Test" in the purchase of pig iron, and in controlling a foundry mixture. Remember that we ignore phosphorus, sulphur, and manganese in our casting, but in purchasing iron always give preference to iron having the least, (and always buy the purest coke possible, because it gives most heat.) Carbon must be taken as we find it. The more there is, the less silicon will be required to produce a desired result, and vice versa. Silicon can do nothing except through carbon, and carbon may be so low that silicon cannot reduce shrinkage. You must know from such tables as Series I, II and III the average silicon in the grades of iron which you use. Use as many varieties as you can, counting each number and name a variety. This is to lessen the chances for change in quality of casting, on account of change in some iron. To make your first mixture, if your casting ought to contain 2.25 per cent. of silicon, (err by having it too high rather than too low,) make a mixture for the cupola charge which will give approximately 2½ per cent. Run off a heat, and make one flask containing a square and a flat test bar, cast in yokes to get shrinkage and chill, and two flasks containing only square bars. Arrange to catch the iron at one time each day, and treat it always in exactly the same way. Perhaps the best way for ordinary practice is to pour it at once after it is skimmed. If the castings are satisfactory, the record of these test bars will be standard, if not increase or decrease silicon by varying the proportion of irons, until the castings are satisfactory, and then keep as close to this record as possible. You now know what you are making, and make a rule never to vary a mixture by more than one or two irons, and not more than 100 pounds of each at one time. If you wish on account of price, to change one or more of your irons, order a car load and put 100 pounds on each charge, instead of the iron you wish to abandon. If shrinkage rises, the silicon in the new is not as efficient as in the old iron, and if you use it you will have to get the silicon necessary to restore shrinkage from some other iron. If shrinkage goes down the silicon of the new iron is more efficient than the old, and you can increase your scrap, or other low silicon iron.

In the purchase of coke, if you wish to tell which is best, have the sulphur in your casting determined before you make any change. Then without making any change in iron mixture, substitute another coke, and get sulphur determination of casting. After a few trials you can tell which coke imparts most sulphur in your iron, and this analysis is better for you than any determination of sulphur in coke, which is rarely satisfactory. Or you can simply rely on your test bar record, which will tell you which coke makes the best casting without any worry about why.

This is really using chemistry in the foundry, but in a simple, practical way, dealing only with results.

THE advantage of bicycling, long ago admitted, grows apace. Philadelphia authorities last season adopted the use of the wheel in their park department, and elsewhere it is a matter of record that much time has been saved, and otherwise almost impossible results secured by using the wheel. Boston intends, as usual, being at the front in all matters pertaining to expediting important business, and the Park Commissioners of the city have voted to adopt the bicycle for the use of the park policemen. An order for a full equipment of the Columbias was placed with the Pope Mfg. Co., last week.—[Boston Post.

As there are 8,000,000 bushels of grain afloat at Chicago and 46,000,000 bushels awaiting shipment at various lake harbors, much interest is felt in an early opening of the Erie Canal. In reply to a letter from Secretary Thurstone, of the Buffalo Merchants' exchange, asking that the Canal might be opened between April 10 and 15, Superintendent of Public Works Hannan said that a contract was awarded a few weeks ago to construct a stone wall three-quarters of a mile in length on the Erie Canal, near Schenectady, and it would be impossible to open the canal before May 1.—[Railroad Gazette.

METHODS OF IRON AND STEEL ANALYSIS.

The sub-committee on methods for the analysis of iron and steel, appointed at the World's Congress of Chemists at Chicago, have sent the following bulletin to the iron and steel chemists of the country, so far as they could get their names. They earnestly request that any who do not receive a copy of the circular, but who do see this, will comply with the request of the bulletin, the same as though they had received a circular direct:

DEAR SIR:—At the World's Congress of Chemists in Chicago a sub-committee of the original committee on International Standards for the Analysis of Iron and Steel was appointed to consider the subject of standard methods.

This sub-committee consists of Dr. C. B. Dudley, chairman, Messrs. A. A. Blair, W. P. Barba, P. W. Shimer and T. M. Drown. It has recently held a meeting and has decided to recommend standard methods in iron and steel analysis to be used as the basis of commercial transactions. The sub-committee fully appreciates the fact that these methods, to have the highest value, should be in facility and in time of execution such that they will readily recommend themselves for daily use in iron and steel works.

To further this end the sub-committee wishes to have the co-operation of the iron and steel chemists of the country, and to ask them for a brief outline of the processes or methods they use and prefer for the determination of different elements in iron and steel, and for such other information and suggestions as they think will aid it in the work before it. The sub-committee recognizes the fact that it will add immensely to its efficiency and value if the iron and steel analysts of the country will take a personal interest in it, and aid it by their counsel and active influence.

You are therefore requested to send to the Chairman of the Sub-Committee, as soon as convenient, such an outline as you may deem sufficient to fully describe your practice. It is suggested that you follow the general plan here indicated, by answering the following questions, which may be referred to by number to save you unnecessary trouble:

1. What general method do you use for the determination of phosphorus in iron and steel?
2. What special precautions do you consider necessary to make this method reliable?
3. What precautions do you take to prevent the interference of arsenic?
4. What factors do you use in your calculations?
5. What variations do you introduce in the case of iron ores or slags?
6. Do you use the same method in pig iron and steel and do you consider the results equally reliable?
7. Do you ever examine the residues insoluble in acid, in pig irons, or iron ores and do you ever find phosphorus in them?
8. Are all your determinations made by the same method, or do you check your work by reference to another method, and if so, what method do you use for this purpose?
9. How many determinations do you make a day in your laboratory under ordinary circumstances?
10. What do you consider the greatest length of time necessary to obtain a result, permissible in your work?

The Sub-Committee begs that you will send at the earliest possible moment as full replies to all or any of the above questions as you conveniently can, and assures you that in making use of any details that may be original with you, you shall have full credit. You will likewise be furnished with copies of the various reports.

CHAS. B. DUDLEY,
Chairman Sub-Committee, Altoona, Pa.

Approved,
J. W. LANGLEY, Chairman Com. on Int. Standards.

THE Howard-Harrison Iron Co., of Bessemer, Ala., have made the first shipment of a lot of 10,000 tons of pipe for which they secured the contract from the city of Philadelphia in competition with several Northern companies.

BUFFET sleeping cars are used in the through service over the Nickel Plate Road between Chicago, New York and Boston.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trades:

Freeport, Ill.—Warner Hardware Co.; capital, $20,000; for the manufacture and sale of hardware; incorporators: Leman A. Warner, Geo. W. Warner, Emil A. Hoefer. Address letters care of Leman A. Warner, Freeport, Ill.

Chicago, Ill.—Ideal Boiler Co.; capital, $100,000; for manufacturing and selling heating apparatus; incorporators: Franklin L. Chase, N. Blossom, Levi A. Eliel. Address letters care of Levi A. Eliel, 1503 Ashland Block, Chicago, Ill.

Bloomingdale, Ind.—The Bloomindale Canning Company of Bloomingdale, Ind.; capital, $15,000; for a general manufacturing and canning business; incorporators: Hiram M. Brown, Thos. B. Woody, Mahlon Reynolds, John T. Staff, Seigel Byers.

Camden, N. Y.—Camden Water Wheel Works; capital, $24,000; for manufacturing water wheels and machinery; incorporators: W. G. Percival, DeWitt T. Wood, J. I. D. West, Camden, N. Y. Address letters care of Davies & Johnson, Camden, N. Y.

Chicago, Ills.—Arthur Kuhns Co.; capital, $20,000; for manufacturing and selling oil cans and oil tanks in the city of Chicago; incorporators: Jos. B. Long, Henry E. Brown, Edgar A. Kuhns. Address letters care of Jos. B. Long, 606 Chamber of Commerce, Chicago.

Chicago, Ill.—The Cylindrical Package Co.; capital, $500,000; for manufacturing packages of all kinds and machinery; buy, own and sell patents; incorporators: F. B. Goodwin, A. J. Burton, G. A. Gage. Address letters care of Geo. A. Gage, 21 Quincy st., Chicago, Ill.

Indianapolis, Ind.—McNamara-Koster Foundry Co.; capital, $10,000; to manufacture all kinds of castings, patterns and machinery, etc.; incorporators: Peter J. McNamara, Louis Koster, Richard Pierce, Indianapolis. Address letters care of Louis Koster, Indianapolis.

Chicago, Ill.—Gilfillan Scale & Hardware Co.; capital, $50,000; for manufacturing and selling scales and hardware specialties; incorporators: E. N. Gilfillan, Wm. N. Plauze, Jos. O'Connor. Address letters care of E. N. Gilfillan, Headquarters 1st Brigade, I. N. G., Chicago, Ill.

Jamestown, N. Y.—The Wyckoff Harvester Co.; capital, $100,000; for manufacturing agricultural implements; incorporators: A. E. Hall, 139 Forest ave.; W. A. Kent, 412 E. 6th st., Jamestown, N. Y.; J. N. Wyckoff, Perry, N. Y. Address letters care of A. C. Wade, Jamestown, N. Y.

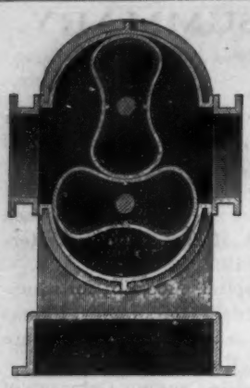
New York City, N. Y.—Bramhill Deane Co.; capital, $300,000; for manufacturing and dealing in cooking, heating and ventilating appliances; incorporators: R. E. Deane, G. G. Brooks, Geo. Rawlins, 264 Water st., New York City. Address letters care of Mapes & Kelley, 200 Broadway, N. Y. City, N. Y.

Brooklin, N. Y.—Donlon & Miller Mfg. Co.; capital, $50,000; for manufacturing gas and electric fixtures; incorporators: Jno. Donlon, 107 Adams st.; A. S. Miller, 212 Clinton st., Jno. F. Miller, 212 Clinton st., Brooklyn, N. Y. Address letters care of Grout, DeFore & Mayer, 189 Montague st., Brooklyn, N. Y.

Detroit, Mich.—International Electrical Supply Mfg. Co.; capital, $500,000; for manufacturing and dealing in electrical machinery and supplies; incorporators: A. H. Davis, Chas. G. Willoughby, O. W. Hannan, Wm. M. Durand, Hiram Jones, Detroit, Mich. Address letters care of Jonathan Palmer, Jr., Detroit, Mich.

New York, N. Y.—F. S. Hutchinson Co.; capital, $20,000; for manufacturing hoisting appliances, hardware, etc.; incorporators: F. S. Hutchinson, Oyster Bay, N. Y.; J. C. O'Connor, 12 E. 44th st.; T. D. O'Connor, 12 E. 44th st., N. Y. City, N. Y. Address letters care of R. & E. J. O'Gorman, 49 Chambers st., N. Y. City, N. Y.

Cleveland, O.—The Johnson Co.; capital, $5,000,000; for manufacturing steel, iron and coke, in all varieties and forms, mining, producing, etc., all supplies necessary for such manufacturing; incorporators: Tom L. Johnson, A. J. Moxham, Andrew Squire, Jas. Parmlee, H. J. Davies. Address letters care of Squire, Sanders & Dempsey, Cleveland, O.



WE GUARANTEE

The Simplest, The Most Durable,
The Best Designed, The Most Efficient,
The Best Constructed, The Most Economical

POSITIVE PRESSURE BLOWER NOW ON THE MARKET.

On the above basis, patronage is respectfully solicited by

The Connersville Blower Co.,

CONNERSVILLE, IND.

Manufacturers of a full line of Blowers, Gas Exhausters, Pumps, Etc.

Correspondence Invited. - - - - - - - Estimates Cheerfully Furnished.

LAKE SHORE IRON WORKS, MARQUETTE, MICH.,

Manufacturers of MINING MACHINERY.

HEAVY ROCK CRUSHERS FOR IRON ORE

A SPECIALTY.

THE GARDEN CITY SAND CO., Suite 1015 Security Bldg, CHICAGO, ILL.

FIRE BRICK, FIRE CLAY,

For Blast Furnaces, Cupola Lining, Boiler Setting, Smoke Stack Lining, or Any Other Purpose.

EVERY CLASS OF SPECIAL SHAPES AND SIZES.

ALL KINDS OF

Foundry Supplies.

FACINGS, BLACKINGS AND MOULDING SANDS

Of All Kinds.

Cincinnati, O.—The Queen City Excelsior Machinery Co.; capital, $100,000; for manufacturing, selling and dealing in machines for the manufacture of excelsior; manufacturing excelsior, and dealing in patent rights, etc.; incorporators: Chas. L. Arzeno, Francis Speth, Louis G. Siebel, Louis H. Shafer, Henry J. Weiler. Address letters care of W. J. Davidson, Cincinnati, O.

Cincinnati, O.—The F. H. Lawson Co.; capital, $150,000; for manufacturing and dealing in metals, manufacturers of metal, utensils and appliances for domestic use, house furnishing goods, etc.; incorporators: Franklin H. Lawson, Fenton Lawson, W. C. Lawson, F. Rogers Lawson, Jos. M. Eversfield. Address letters care of Harmon, Colston, Goldsmith & Hoadley, Cincinnati, O.

Chicago. Ill.—Gagnier-Griffin Suspended Railway Bridge Co.; capital, $1,000,000; to build, maintain and operate suspended bridges for railways, ferry and street ways and the transmission of passengers and freight by means of suspended cable cars and for other kindred purposes, and to manufacture and deal in supplies for suspension bridges; incorporators: G. H. Griffin, J. Q. Baird, J. S. Chadwick, B. J. Gagnier, Geo. Mason, J. S. Wilkin. Address letters care of G. H. Griffin, 1132 Masonic Temple, Chicago.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

I. W. Brown, 207 Fifth ave., Chicago, will buy a small second hand gas engine.

D. H. Haeger, Elgin, Ill., is in the market for a second-hand engine, good as new, of 80 horse power. In answering give lowest price.

The Quick City Steel Casting Co., of Franklin, Ind., who are erecting a plant, are in the market for engine and boiler, a traveling crane, and corrugated iron.

C. Graham, Middleton, Ind., is in the market for muck bar, sheet or bar mill, or all of them; or would negotiate with owner of such equipment who is willing to join an established concern desiring to increase its plant.

R. E. Grant, of Middleport, O., wants to purchase a second-hand 14″ x 24″ slide valve engine, a 20″ x 20″ x 5′ iron planer, an 18″ x 10′ engine lathe, small drill press and lathes, small wood-working planer and matcher and band saw. Full specifications, name of maker, condition and best price of each tool, delivered on cars at Middleport to accompany first letter.

At the office of the Supervising Architect, Washington, D.C., sealed proposals will be received until 2 p. m., May 2, 1894, for all the labor and materials required to fix in place complete, the low pressure steam heating and machanical ventilating apparatus, including elevator power boiler, etc., for the U. S. Court House and Post Office Building, at Paris, Tex.

The Baker Forge Co., of Ellwood City, Pa., have their buildings under contract and expect to be filling orders within 90 days. They will manufacture wagon hardware, pressed steel, steel wagon parts, etc. They will purchase belting, blowers, lathes, machine shop supplies, milling machines, planers, bolt cutters, chucks, coke, drilling machines, drop presses, emery wheels, files, fire brick and clay, power hammer, punching and shearing press, twist drills, taps and dies, and wheelbarrows.

New Construction :—

The Warren Hardware Co., of Warren, O., have decided to erect a large steel range works.

The Eagle Iron Works, of Brooklyn, N. Y., is adding a three-story brick factory, 25x100 feet, which will be used for heavy work. All the necessary machinery will soon be placed.

Adams Bros. will erect a brass foundry at Carpenter and Kinzie sts., Chicago. The building will be five stories high, 116 feet front by 45 deep and the plant will cost, complete, $28,000.

A new bridge will be built over the Monongahela river at Braddock. The Senate has passed a bill authorizing the West Braddock Bridge Co. to construct it and all that is needed is the President's signature and work will be commenced.

A Washington, Pa., dispatch says: Washington is to have a big tin plate factory, and work on the buildings will be commenced at once. Citizens here today closed up the deal with the syndicate of capitalists represented by N. E. Whittaker, the Wheeling iron manufacturer. The conditions of the contract were that citizens should buy 400 lots at $200 per lot. Four hundred hands will be employed.

Additions, Enlargements, Removals, Etc.:—

L. J. Pender has moved his boiler works from Union City, Ind., to Hamilton, O., and will increase his business at the latter place.

The new Fifield machine shop at Lowell, Mass., is nearing completion. The structure is 370x60 feet in size and two stories high.

Newark, O., citizens are endeavoring to raise $20,000 with the object of inducing the Newark Machine Works, now located at Columbus, to remove their plant to Newark.

The Pittsburg Wire Co., of Braddock, are building a frame addition to their plant, which will be about 40x100 feet in size.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

GOVERNMENT ✦ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.: No. 222 So. Third St., Philadelphia, Pa.; Lewis Block, Pittsburgh, Pa.

FIRE BRICK.

High Grade Fire Brick for Melting Furnaces, Heating Furnaces, Blast Furnaces, Cupola Lining,

And all purposes for which Fire Brick are used. A Specialty made of High Grade Fire Brick. All Shapes.

GROUND CLAY IN BULK OR SACKS. SEND FOR LIST OF SHAPES.

The American Fire Brick & Clay Co.,

MINERAL POINT, OHIO.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

A number of new wire and barbed wire machines will be put in, greatly increasing the capacity of the plant.

General Industrial Notes:—

W. S. Beeman has started a machine shop at Ashland, Wis.

The Andrews Hitchcock furnace at Hubbard, O., has blown out.

Furnace No. 1 of the Junction Iron Co., at Mingo Junction, O., went in blast March 13.

Spearman furnace at Sharpsville, Pa., has again blown out after three months' activity.

The Scottdale (Pa.) Iron & Steel Co. have made a 15 per cent. reduction in puddlers' wages.

The Buffalo Furnace averaged 224 tons a day the last week in March. The best day's output was 260 tons.

Mount Vernon Furnace of the Campbell Iron Co., in Lawrence County, O., will blow out on the 12th inst.

Warren Webster & Co. have moved their Chicago office from 2 S. Canal st., to room 1502 Monadnock Block.

The rolling mill of the Central Iron & Steel Co., at Brazil, Ind., which has been idle for some time, has resumed.

The Vulcan Iron Works Co., of Toledo, report business active with bright prospects for the demand for steam shovels.

After an enforced idleness of nearly half a year, the extensive puddle mills of the Bethlehem Iron Co., resumed operations April 4.

Miller's foundry, at Youngstown, O., is in steady operation. Small orders and chill roll work make up the bulk of the business.

Brown, Bonnell & Co., Youngstown, O., are running the No. 3 puddle mill, 8 inch finishing, hoop mill and No. 3 bar mill this week.

From 2,838 in January and 3,171 in February, the Pennsylvania Steel Co.'s force of men at Steelton, Pa., increased to 3,298 in March.

A new blast furnace is said to be contemplated by the Bellaire, O., Nail Works, insuring a much larger output from their steel works.

The Shenango Valley Steel Co., of New Castle, Pa., made a record of 15,100 gross tons of steel billets in March, in their one blooming mill.

Wm. Tod & Co.'s machine shops, at Youngstown, O., started double turn, Monday, and in all probability will continue to work so for some time.

Jones & Laughlins and the Oliver Iron & Steel Co., Pittsburg, have refused to sign the puddlers' scale at $4, but will give the men work on that basis.

Operations at the South Pittsburg (Tenn.) Pipe Works are being pushed, about 300 men being now at work. An average of 100 tons of iron is being milled daily.

The Girard, (O.) Stove & Foundry Co. are talking of erecting another building, and if this is done there is a probability that the plant will be removed to Youngstown.

The date of the removal of the Akron Steam Forge Co. from Akron, O., to Muncie, Ind., is still indefinite, but it will be considerably later than was originally planned.

The Sterling Emery Wheel Works, of Tiffin, O., which recently closed down owing to business complications, is being operated again, by A. H. Kimbal, of New York.

The Means & Russell Iron Co., of Ashland, Ky., have blown out their Bellefonte furnace to remain idle the rest of the year, on account of the bad outlook for charcoal pig iron.

The Ætna-Standard Iron Co., of Bridgeport, O., have their plate mill in operation again. Their light sheet, bar, galvanizing and corrugating departments are going satisfactorily.

Some of the workmen in the Union Rolling Mill Co.'s mill at Newburg, O., refused to stand the 10 per cent. reduction recently agreed upon and walked out. Their places were filled.

The Bessemer departments of the Wellman Iron & Steel Co., of Chester, Pa., which have been closed for several months, have started up with a large order for the Tidewater Steel Co.

The Warren, O., mill of the Union Iron & Steel Co., which has been idle for months, will remain shut down indefinitely. The men had expected a resumption after the recent scale reduction.

The Vulcan Iron Co., of New Castle, Pa., manufacturers of rolling machinery, have added a boring mill and a large sized draw head shaper made by the Morton Mfg. Co., of Muskegon, Mich., and some new wood working tools have also been placed in their pattern shop.

At Pottstown, Pa., the employes of Potts Bros.' rolling mill decided to return to work on Monday. The company has a six months' contract. The valley mill of the Glasgow Iron Co. has also resumed.

The Ohio Stove Co., of Tiffin, O., call attention to the Mississippi Valley Stove Co., Fulton, Ill., the corporate name under which their new plant at Fulton is operated. All orders for stoves and repairs are filled at Fulton.

The capital stock of the newly formed Kansas City Steel & Iron Works of Kansas City, is $350,000, of which one-half is said to be paid in. The object of the company is the manufacture of steel, iron, brass and copper.

It is possible that the plan of reorganization for the Pennsylvania Steel Co. and the Maryland Steel Co. may be carried into effect June 1. It is said to be satisfactory to the creditors and it remains for the stockholders to assist in putting the companies on a working footing.

The improvements in the hoop mill of the J. Painter & Sons Co., Pittsburg, are about completed and work will start soon. It will be the largest plant of the kind in the world. The capacity will be 60,000 pounds per turn. The capacity of the largest mill now is 40,000 pounds.

All of the big World's Fair buildings were sold at private sale April 7 to L. C. Garrett, a St. Louis contractor for $75,500. The purchase includes the Manufactures building, Machinery Hall and the buildings of Administration, Electricity, Mines, Agriculture, Fisheries, Transportation.

On April 6, all the laborers of the mills, shops and yards of the Pottsville Iron & Steel Co., Pottsville, Pa., began to work ten hours. They had been working eight and nine hours. There is a prospect of steady work for the next three months, as several heavy orders have been received.

Application has been made, at West Superior, Wis., by W. P. Guild, secretary of the Lehigh Coal & Iron Co., for a receiver of the West Superior Iron & Steel Co. and Land River Improvement Co. The petition asked that the amount of stock held by John D. Rockefeller be ascertained.

At a meeting of the stockholders of the H. B. Tool Co., of Kent, O., the following directors were elected: E. N. Barber, J. W. Hawkins, W. S. Kent, Edward Snyder, and M. M. Zellers. The officers are: W. S. Kent, president; J. W. Hawkins, secretary and general manager; E. N. Barber, treasurer.

The works of the Chicago Horse Shoe Co., whose offices are at 908 Ashland Block, Chicago, are in full operation and their business beyond expectations. Recent shipments include a car load to Cleveland, and others to New Jersey, Ohio and Tennessee. They are constructing two large machines, for making extra heavy, large and long-heel shoes.

During the past year there were received in New Castle, Pa., about 450,000 tons of ore; 300,000 tons of coke, and 225,000 tons of limestone. During that time there were shipped about 300,000 tons of pig iron; 200,000 tons of Bessemer billets; 60,000 tons of wire rods; 750,000 kegs of wire nails; 50,000 tons of plain wire and 15,000 tons of tin plate.—[Guardian.

The Cockburn Barrow & Machine Co., of Jersey City, N. J., have just turned out a mammoth punching machine for Wm. B. Pollock & Co., the well known Youngstown, O., boiler manufacturers. It weighs 35 tons and has a 50-inch gap. At the tests made before shipping holes four inches in diameter were readily punched in plates one inch thick. Triple gears can be used or these can be dispensed with and velocity employed.

J. Sergeant Cram, referee in the proceedings for the dissolution of the Ohio & Western Coal & Iron Co., reported at New York, showing liabilities of $850,000, besides the deficiency on forclosure of mortgage of the company. Its blast furnace properties in the Hocking Valley sold last year for the merest fraction of their cost. The assets are disputed claims to real estate in Athens county, Ohio. The company had a capital stock of $5,000,000. An order has been entered dissolving the corporation, and Mr. Cram has been appointed receiver.

The sheet mills at the Eagle Iron & Steel Works, ran Monday and Tuesday. The bar mill furnace is being thoroughly overhauled and repaired this week. It is the intention of the management to start every department of the mill next Monday. . . . The Belfont nail factory, which stopped Monday, started Tuesday. The stopping of the steel plant at Ashland will not effect the running of Belfont. It has a considerable stock of steel billets on hand, and steel can be purchased at or near the cost of production.—[Ironton (O.) Register.

Wheeling district notes from the *Ohio Valley Manufacturer*: Every department of the Riverside is now on except one lap weld furnace in the tube works. The volume of production is fully as great as it ever has been. . . . About three-fourths of the sheet mill at the Ætna-Standard are on. The plate mill difficulty, heretofore referred to, has been adjusted and that department is once more in operation. . . The old Sweeny foundry and machine shop building is being dismantled by the city, it being considered unsafe. The foundry has been a famous one in its day and some of the best boats that ever floated on the Ohio, have been equipped therefrom. One by one the old landmarks disappear.

It is quite likely that the McCosh Steel Co., which was recently incorporated in Illinois with a capital stock of $250,000, will decide to locate at Chicago Heights. Messrs. Thompson McCosh and John McLauchlan, officers of the Steel Co., have been looking over this enterprising city, with a view to removing their steel wire nail and barbed fence mills, now located at Burlington, Iowa, to this location. Inducements have been made by the Chicago Heights Land Association to the company for removing to Chicago Heights, and these, with the excellent facilities for obtaining raw materials and the advantage of being so close to Chicago as to enable them to use that city as a distributing point for their product, will make it decidedly an object for the McCosh Steel Co. to locate there. The plant at Burlington is equipped with the latest and

Free Factory Sites at

CHICAGO HEIGHTS

The Industrial Center of Chicago.

Chicago Heights Land Association,

135 Washington St.,

Main Floor Chamber of Commerce Bldg.,

CHICAGO.

FUEL ECONOMY.
SMOKE PREVENTION
IF YOU WANT TO KNOW ALL ABOUT THE VERY BEST FURNACE IN THE WORLD FOR ANY STEAM BOILER
Send for Illustrated Descriptive Pamphlet ON MECHANICAL STOKERS FREE
THE BRIGHTMAN STOKER CO.
CLEVELAND OHIO.

THE THURMAN FUEL OIL BURNER CO. GENERAL OFFICES, 35 and 36 CORDOVA BUILDING,

Jno. S. Thurman, M. E. - Indianapolis, Ind.
We are not connected with any other oil burner company. The only perfect crude oil burner on the market.
The Cheapest and Best. Absolutely Smokeless. It is Economical. Reliable. Requires no Expert to manage. Cheaper than coal. It perfectly Atomizes the Oil with the Air and Steam.
Makes less noise than any other burner.
For Stationary Boilers, Forges, and any branch of industry where heat for any purpose is used.
No Soot. No Sparks. No Smoke. No Odor.
TRY OUR IMPROVED BURNER in your BOILERS. We guarantee to evaporate more water with one pound of oil than any other burner. Write for prices.
NOTE.—If you are using oil as fuel, and are not getting good results, we would be pleased to send you our burners on trial. The oil in our burners can be atomized by either steam or air.

GENERAL AGENTS
RED SEAL BOILER COMPOUND,
For Removal and Prevention of Scale in Steam Boilers.
BRANCH OFFICES:
184 William St., N. Y. 509 Monadnock Blk., Chicago, Ill.

TELEPHONE 1916
ECLIPSE MUSIC PLATES
ELECTROTYPE
ENGRAVING CO.
58 FRANKFORT ST. CLEVELAND

most modern machinery and employs from 250 to 400 men, making it a great addition to the already long list of manufacturing plants at Chicago Heights.

The E. W. Bliss Co., of Brooklyn, N. Y., write us: "We are erecting at our works two of the largest and heaviest presses we make, viz., our Nos. 14 and 15 toggle drawing presses. The No. 15 press weighs about 140,000 pounds and is driven by an engine attached to it. It is about fourteen and a half feet in height and has a width between the uprights of fifty-four inches, and will draw articles up to eleven inches in depth. It can be started or stopped at any point in the stroke by means of a friction clutch. These presses are used in drawing up such articles as kitchen boiler heads, cylinders, steel sinks, heavy black iron and enameled ware. The No. 15 press we expect to ship in about a week to England, to be used in drawing up heavy steel shells. The No. 14 press is somewhat lighter, weighing about 75,000 pounds, having a distance between the uprights of thirty inches, and will draw articles in depth up to ten and a half and twelve and a half inches. This press, while it will draw articles of greater depth, has not the requirements for doing nearly as heavy work as the No. 15 press. This press is being built for one of our large tinware stamping concerns in this country for drawing up heavy enameled ironware of various descriptions. We also have a large number of smaller machines in process of erection in our works. Enquiries for new tools from manufacturers who are increasing their capacity have been very frequent lately and give assurance of better times not very far ahead."

THE people along the Nickel Plate Road have the advantage of through sleeping car to California points.

PATRONIZE the through car service via the Nickel Plate Road to Chicago, New York and Boston.

Steel Rolls for Ironmaking.

An English exchange says: In the South Staffordshire ironmaking district an experiment was tried some few years ago of using rolls made entirely of Siemens steel, instead of the cast iron rolls hitherto in universal use for the rolling of finished iron. The result was so far successful that the use of steel rolls in place of iron, promises in the near future to be pretty general. The chief advantage of steel rolls over iron is their greater tensile strength, and their consequent immunity from breakage under a severe or sudden strain. Of late years the losses to ironmasters in South Staffordshire due to the breakage of rolls has been enormous. There was a time when cast iron rolls were made exclusively of all-mine cold-blast pig, and some few leading firms still maintain this wholesome custom, but under the stress of competition other firms are making rolls of mixed iron, with results which are too often disastrous. Steel rolls are dearer to buy in the first instance, and they are not hard enough for certain classes of work, but for purposes to which they are suited there can be no doubt that they possess economical and other advantages which will very shortly bring them into more general use.

French Iron Trade in 1893.

The French iron trade last year, while it did not increase over the preceding year, showed only a decrease so small that it may be said to have been substantially the same in 1893 as in 1892, therein differing materially from that of England and the United States. The total production of pig iron of all descriptions last year was 2,032,567 metric tons, a decrease of only 24,691 tons, or 1.2 per cent., the falling off being chiefly in foundry iron and Bessemer pig.—[Engineering and Mining Journal.

THE through sleeping car to California is now running regularly. Talk to agents of the Nickel Plate Road about it.

Business Opportunity

Wanted a man with from $15,000 to $20,000 to invest in a good paying manufacturing business, with or without active participation in the management. This business is open to full inspection, and is old and well-established, with a good paying trade.

Address Box 202,

IRON TRADE REVIEW,

1141 Monadnock Blk,

CHICAGO.

The Advertiser who sticks to printer's ink in dull months will find trade sticking to him when the turn comes.

Geo. H. Anderson & Co.,

524 Standard Bldg., Wood St.
PITTSBURG, PA.

High Grade Fire Brick

GRATE SETTINGS, ETC.

BRANDS:
"Anchor," Extra. "Garfield," No. 1. "I X L" Sand.

Locomotive Tile a Specialty.

Works and Mines at Bolivar, Pa.

THE

LONG & ALLSTATTER CO.

HAMILTON, OHIO, U. S. A.

Manufacturers of Belt, Steam and Electrically driven

POWER PUNCHES AND SHEARS,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops, Plow Shops, etc.

Send for Catalogue. (3)

Cleveland Stamping & Tool Co.

We press, cut, stamp and draw all kinds of sheet metal into all kinds of shapes, and make all kinds of

DIES and PRESSES.

Send us a sample or drawing of what you want stamped or blanked, or what you want to stamp or blank, and we will quote you prices on the article, or on the machinery to make it.

CLEVELAND, OHIO.

STEEL CASTINGS

FROM 1 TO 40,000 POUNDS WEIGHT.
Of Open Hearth, Chester or Bessemer Steel
True to Pattern. Sound. Solid.
GEARING OF ALL KINDS, CRANK SHAFTS, KNUCKLES FOR CAR COUPLERS.
Cross-Heads, Rockers, Piston Heads, etc., for Locomotives.
Steel Castings of every Description
CHESTER STEEL CASTINGS CO.,
WORKS: CHESTER, PA. OFFICE: 407 LIBRARY STREET. - PHILADELPHIA, PA.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

Bucyrus Steam Shovel & Dredge Co.,

—MAKERS OF—

STEAM SHOVELS — In Five Sizes for Railroad and Contract Work, Brick Yards, Stone Quarries, Stripping and Handling Iron Ore, Coal, Etc.

STEAM DREDGES — Of All Types and Sizes; for All Purposes; Elevator, Dipper, Clam Shell, Suction. Special Machines for Special Work.

WRECKING CARS — BOTH HAND AND STEAM. CAPACITIES 10 TO 35 TONS.

PILE DRIVERS — WITH EITHER DROP OR STEAM HAMMERS.

SOUTH MILWAUKEE, WIS., or BUCYRUS, OHIO.

The "Little Giant" Excavator.

WEIGHT 20 TONS.
CAPACITY 1,500 CUBIC YARDS PER DAY.

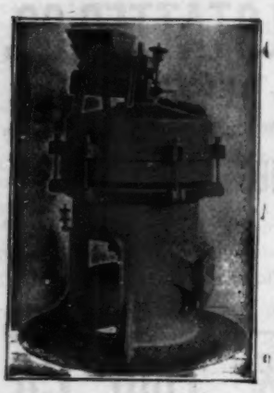
The only Traction Shovel on the market, and nothing approaches it for general purposes.

VULCAN IRON WORKS CO., TOLEDO, O., U. S. A.

MANUFACTURERS OF
Dredges and Excavators.
Write for Photographs and Descriptive Matter.
RAILROAD CASTINGS.

There is no Steam Shovel on the market so well adapted to handling Iron Ore as our "Giant." We guarantee 2,500 tons in 10 hours.

WE ARE MANUFACTURERS OF THE MORRIS PATENT

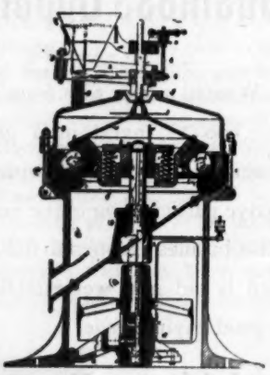


Ball Pulverizer and Rock Breaker

on new and advanced principles, almost entirely ELIMINATING FRICTION in applying power and REDUCING WEAR AND TEAR to a fraction of that of other machines for same class of work. Will produce finished product, either wet or dry, to any degree of fineness. Requires less power and costs less than any other machine of same capacity, and has no equal in the market.

Effective. Compact. Durable.

One machine, costing $1,000, using 8 H. P., will pulverize 24 tons per day to 40 mesh and finer and a corresponding quantity to any degree of fineness. For full particulars and prices, call on or address



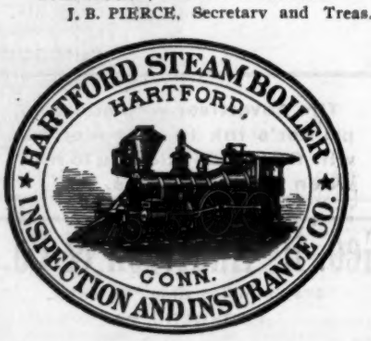
THE AMERICAN MINING & MILLING MACHINERY CO.,

29 Euclid Ave., CLEVELAND, O. 280 Caxton Blk., CHICAGO, ILL.

A. H. LEITCH, Pres JOHN C. LEITCH, Sec. and Genl. Man. JOHN A. WILSON, Treas.

PITTSBURG, PA. Works and Mines, Westmoreland, Pa.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treas.



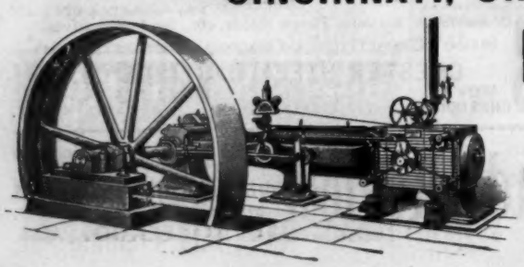
BURWELL & BRIGGS, General Agents, 208 Superior Street, Cleveland, O.

C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland O.

J. E. WOLCOTT, Special Agent, 96 4th Avenue, Pittsburgh, Pa.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines.

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys,

Belt Elevators, Saw Mills

SUBSCRIBE FOR

THE IRON TRADE REVIEW.

$3.00 Per Year.

—FOR—

JESSOP'S STEEL Tools, Drills, Dies, etc.

Established over a Century ago. Manufactory, SHEFFIELD, ENGLAND.

CHIEF AMERICAN OFFICE, 91 JOHN ST., NEW YORK.

WM. JESSOP & SONS, Limited.

"Medal—World's Columbian Exposition, 1893."

All sizes carried in stock by The W. Bingham Co., Cleveland, Ohio.

CRUCIBLE STEEL CASTINGS

WHY?

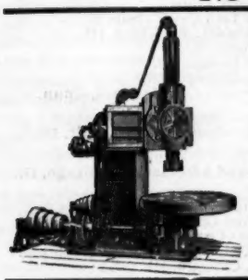
Why send your **PATTERNS EAST** and wait **FOUR WEEKS** for your **CASTINGS** when you can get

SOLID STEEL CASTINGS

at home **PROMPTLY.**

ANSWER **THE KING & ANDREWS CO.,**

218 N. UNION ST., CHICAGO, ILL.



BICKFORD DRILL & TOOL CO.,

35 Pine St., Cincinnati, O.

BUILDERS OF

UPRIGHT, RADIAL, UNIVERSAL

RADIAL, MULTIPLE,

DRILLS.

BORING AND TURNING MILLS.

Barnes' Upright Drills.

20 TO 42 INCH SWING.

Lever and worm feed, back geared, self feed and automatic stop; with or without sliding head.

COMPLETE LINE HIGH GRADE TOOLS.

W. F. & John Barnes Co.,

191 Ruby St., ROCKFORD, ILL.

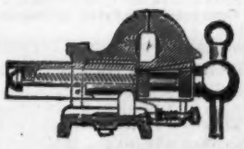
VISE.

Patented Dec. 27, 1892.

IT HAS QUALITIES THAT ARE UNDISPUTED.

Rapid, Active, Prompt.

One movement in and out, one turn of the hand and the work is secured.



The Capital Machine Tool Co., AUBURN, N.Y.

SECOND HAND.

20″x10′ Prentiss Standard Engine Lathe, compound rest, power cross feed and taper attachment.
24″x10′ Empire Engine Lathe, compound rest.
11″ Empire Shaper, two tables.
No. 3 and 4 spindle Garvin Gang Drill.
No. 2 Cincinnati Milling Machine.
No. 1 Prentiss Hand Miller with arm.
36″ Stevens Pulley Lathe, two tools.
60″ Niles Pulley Boring Machine.
1½″ Pratt, Whitney Bolt Cutter.
30x30x8′ Pease Planer.
36x36x12′ Pease Planer.

Send for complete list of second-hand tools.

A full line of new tools, including lathes, planers, milling machines, presses, drills, shapers, etc. Send for list.

PRENTISS TOOL & SUPPLY CO.,

59 S. Canal St., Chicago.
115 Liberty St, New York.

FOR SALE.

Second-Hand Machinery

— FOR —

Machine Shops,
Foundries,
Boiler Shops,
Wood Shops.

If your wish to BUY or SELL, address

W. H. ROBERTSON,

54-60 S. Canal St., -:- CHICAGO, ILL

NOW is the time to INVEST in

SOUTHERN TIMBER-MINERAL LANDS,

Before prices advance. All kinds of mines for sale.

E. C. ROBERTSON,

Terms Easy. CINCINNATI, O. Titles Perfect

Subscribe for The IRON TRADE REVIEW.

Cranes

CUPOLAS.
LADLES.
TRUCKS.
TUMBLERS.

WHITING'S IMPROVED

Car Wheel Foundry Plant.

Write for Circulars.

DETROIT FOUNDRY EQUIPMENT CO.,

Detroit, Mich.

702 Temple Court, CHICAGO.

New York Office, 182 Front st.

SPECIAL BARGAIN LIST OF MACHINERY, BOTH NEW AND SECOND-HAND, NOW AT OUR WORKS AT CHICAGO HEIGHTS.

MINING MACHINERY:

One Blake crusher, size of opening 9″x15″, especially adapted for crushing Macadam, ores, etc. Good as new, $300.00
One flat screen 3′x6′ for screening Macadam, 25.00
Two new improved Blake Crushers 7″x10″, each 250.00
One set new Cornish rolls 20″ dia., 10″ face, all complete, 325.00
One Heald & Cisco Centrifugal pump 8″ suction, 6″ discharge, second-hand but excellent condition, 175.00
30 set light car or truck wheels and axles 3′ gauge, flanged wheels 9″ dia., 2″ face, axles 1½″ dia., with box for axles, all new and in good condition, each 3.50

ENGINES:

Two new first-class heavy horizontal slide valve engines, cylinders 12″x16″, each 350.00
One horizontal slide valve engine, cylinder 7″x12″ second-hand, first-class condition, 125.00
One 8″x12″ horizontal Erie City Iron Works center-crank engine, second-hand but in good condition, complete with governor 160.00

MISCELLANEOUS:

One screw cutting lathe, 22″ swing, 8′ bed, second-hand, 125.00
One Sturtevant exhaust fan No. 21, suction pipe 16″ dia., second-hand, 50.00
One Sturtevant pressure blower No. 4, with 38′ of 12″ pipe made of No. 14 iron for same, also elbow 8′ radius, second-hand, 60.00
Two Root pressure blowers No. ½, second-hand, each 25.00
Eight ⅜″ steel shells 12′ long, 6′ 6″ outside dia., each with oval dome 22″x30″x24″. They are just as good as new. Price 1¼c per lb.

Address for further particulars regarding above machinery.

WALBURN-SWENSON CO.,

944 Monadnock Block, Chicago.

DON'T

YOU THINK A LAUNDRY

IN CONNECTION WITH YOUR PRESENT BUSINESS

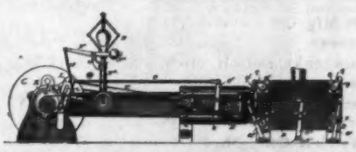
WOULD PAY YOU?

If interested, write to the

CHICAGO LAUNDRY MACHINE CO.

32 W. WASHINGTON ST.,

CHICAGO.



Marshall Valve Gear

For operating the valves of a Corliss engine without the use of dash pot by means of a slotted link of the Porter-Allen type. Operates by means of an eccentric on the main shaft.

Far Superior to the Old Style of Valve Gear.

Send for circulars or other information to

GEORGE MARSHALL, Fremont, Neb.

BUYERS' DIRECTORY OF IRON AND STEEL TRADES.

Analytical Chemists—
Robert W. Hunt & Co., Chicago, Ill.
Cary & Moore, Chicago, Ill.
Dickman & MacKenzie, Chicago, Ill.
Hollis & Emmerton, Chicago, Ill.

Anti-Friction Metal—
Magnolia Anti-Friction Metal Co., New York.

Automatic Hose Valves—
Buffalo Fire Equipment Co., Buffalo, N. Y.

Automatic Stokers.—
Brightman Stoker Co., Cleveland, O.

Barrows—
The Kilbourne & Jacobs Mfg. Co., Columbus, O.

Belt Elevators—
Lane & Bodley Co., Cincinnati, O.

Blacksmith and Carriage Supplies—
Weber & Co., Cincinnati, O.
G. B. Schulte Sons Co., Cincinnati, O.

Blowers—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Connersville Blower Co., Connersville, Ind.
Buffalo Forge Co., Buffalo, N. Y.

Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York.
Wm. B. Pollock & Co., Youngstown, O.
E. H. Jones & Co., Cleveland.
Weston Engine Co., Painted Post, N. Y.
Brightman Stoker Co., Cleveland, O.
The Brownell & Co., Dayton, O.
C. P. Adams, 807 Cuyahoga Bldg., Cleveland, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
Armstrong Bros., Springfield, O.
The J. C. McNeil Co., Akron, O.
Vulcan Iron Works Co., Toledo, O.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Boring and Turning Mills—
Bickford Drill & Tool Co., Cincinnati, O.
H. Bickford, Lakeport, N. Y.

Chain Belting—
Jeffrey Mfg. Co., Columbus, O.

Chemists—
Robert W. Hunt & Co., Chicago, Ill.
Cary & Moore, Chicago, Ill.
Dickman & MacKenzie, Chicago, Ill.
Hollis & Emmerton, Chicago, Ill.

Chilled and Sand Rolls—
The Lloyd-Booth Co., Youngstown, O.
Wm. Tod & Co., Youngstown, O.

Coal and Coke—
W. J. Rainey, Cleveland, O.
F. J. & H. R. Pool, Cleveland, O.

Consulting Engineers—
Robt. W. Hunt Co., Chicago, Ill.
Richard A. Parker, Marquette, Mich.
Artificial Gas Engineering Co., Pittsburg, Pa.

Cosmetic—
Stevenson Bros. & Co., Philadelphia, Pa.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
Detroit Foundry Equipment Co., Detroit, Mich.
Vulcan Iron Works Co., Toledo, O.

Cupolas—
Detroit Foundry Equipment Co., Detroit, Mich.
Greiner Economical Cupola Co., Chicago, Ill.
Garden City Sand Co., Chicago, Ill.

Deck Engines—
Vulcan Iron Works Co., Toledo, O.

Dies—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cady Mfg. Co., Cleveland, O.

Drill Presses—
A. P. Quint, Hartford, Conn.
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Foos Mfg. Co., Springfield, O.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Drop Forgings—
The Billings & Spencer Co., Hartford, Conn.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cady Mfg. Co., Cleveland, O.

Ejectors—
James Jenks, Detroit, Mich.

Elevators—
Lane & Bodley Co., Cincinnati, O.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Acme Safety Emery Wheel Co., Detroit, Mich.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.
Berger Bros., Philadelphia, Pa.

Engineers and Contractors—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Richard A. Parker, Marquette, Mich.
Artificial Gas Engineering Co., Pittsburg, Pa.

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland.
Union Electrotype Foundry, Cleveland.

Engines (Gas)—
Otto Gas Engine Works, Philadelphia, Pa.
Van Dusen Gas Engine Co., Cincinnati, O.
Weber Gas & Gasoline Engine Co., Kansas City, Mo.
Hicks Gas Engine Co., Cleveland, O.

Engineers' Specialties—
James Jenks, Detroit, Mich.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
E. H. Jones & Co., Cleveland.
Lane & Bodley Co., Cincinnati, O.
L. Spence & Son, Martins Ferry, O.
Weston Engine Co., Painted Post, N. Y.
Brightman Stoker Co., Cleveland, O.
Wells Engine Co., New York City.
The Brownell & Co., Dayton, O.
Armstrong Bros., Springfield, O.
The John T. Byers Machine Co., Ravenna, O.

Excavators—
Vulcan Iron Works Co., Toledo, O.

Exhaust Heads—
W. C. Lyman, Chicago, Ill.

Explosives—
Hercules Powder Co., Cleveland.

Fans—
Connersville Blower Co, Connersville, Ind.
Buffalo Forge Co., Buffalo, N. Y.

Files, Makers of—
E. K. Morris & Co., Cincinnati, O.
Arcade File Works, Anderson, Ind.

Fire Brick and Clay—
J. Downerd & Son Co., Zanesville, O.
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Garden City Sand Co., Chicago, Ill.
Geo. H. Anderson & Co., Pittsburg, Pa.
Westmoreland Fire Brick Co., Pittsburg, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
American Fire Brick & Clay Co., Mineral Point, Ohio.

Fire Equipment—
Buffalo Fire Equipment Co., Buffalo, N. Y.

Foot and Power Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Foundries—
Harn, Ow & Co., Beaver Falls, Pa.
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati, O.
Lane & Bodley Co., Cincinnati, O.
Brightman Stoker Co., Cleveland, O.
The Lloyd-Booth Co., Youngstown, O.
Taylor & Boggis Foundry Co., Cleveland, O.
Lake Shore Iron Works, Marquette, Mich.
Wm. Tod & Co., Youngstown, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.

Foundry Supplies—
J. Downerd & Co., Zanesville, O.
Garden City Sand Co., Chicago, Ill.
Detroit Foundry Equipment Co., Detroit, Mich.
Greiner Economical Cupola Co., Chicago, Ill.
Anti-Chill Core Compound Co., Peoria, Ill.
American Fire Brick & Clay Co., Mineral Point, Ohio.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Fuel Oil Burners—
John R. Armstrong Co., Chicago, Ill.
Thurman Fuel Oil Burner Co., Indianapolis, Ind

Furnace Linings—
Union Mining Co., Mt. Savage, Md.
American Fire Brick & Clay Co., Mineral Point, Ohio.
Garden City Sand Co., Chicago, Ill.

Friction Clutch Pulleys—
J. H. & D. Lake Co., Massillon, O.

Galvanizers—
H. H. Hodell, Cleveland.

Grindstones—
E. K. Morris & Co., Cincinnati, O.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City, N. J.

Hangers, Pulleys and Shafting—
Lane & Bodley Co., Cincinnati, O.
J. H. & D. Lake Co., Massillon, O.

Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O.
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.

Heavy Hardware—
E. K. Morris & Co., Cincinnati, O.

Hoisting Engines—
Lake Shore Iron Works, Marquette, Mich.
Vulcan Iron Works Co., Toledo, O.
The John T. Byers Machine Co., Ravenna, O.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Investments—
Frank R. Biedler, Baltimore, Md.
Fidelity & Deposit Co., Baltimore, Md.
Geo. Pemberton, New York.

Injectors—
Eagle Lubricator Co., Cleveland, O.
James Jenks, Detroit, Mich.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Berger Bros., Philadelphia, Pa.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.
G. B. Schulte Sons Co., Cincinnati, O.
Geo. H. Sibell & Co., Chicago, Ill.

Iron and Steel Wire—
Trenton Iron Co., Trenton, N. J.

Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
J. H. Outhwaite & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Geo. H. Sibell & Co., Chicago, Ill.

Iron Working Tools—
John Adt & Son, New Haven, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Twist Drill Co., Cleveland, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Prentiss Tool & Supply Co., Chicago, Ill.
A. P. Quint, Hartford, Conn.
Toledo Machine & Tool Co., Toledo, O.
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
The Billings & Spencer Co., Hartford, Conn.

Ladles—
Detroit Foundry Equipment Co., Detroit, Mich.

Land Companies—
Chicago Heights Land Association, Chicago, Ill.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Laundry Machinery—
Chicago Laundry Machine Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Machinists' Tools and Supplies—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Machine Screws—
Illinois Screw Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Harn, Ow & Co., Beaver Falls, Pa.

Mining Machinery—
Lake Shore Iron Works, Marquette, Mich.
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
American Mining & Machinery Co., Cleveland.

Moulding Sand—
Garden City Sand Co., Chicago, Ill.
J. Downerd & Son Co., Zanesville, O.

Municipal Bonds—
Frank R. Biedler, Baltimore, Md.

Milling Machines—
Prentiss Tool & Supply Co., Chicago, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Mines and Mining Stock—
Frank R. Biedler, Baltimore, Md.

Mining Engineers—
Richard A. Parker, Marquette, Mich.

Oil Tanks—
The J. C. McNeil Co., Akron, O.

Ore Crushers—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Machinery Co., Cleveland.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Berger Bros., Philadelphia, Pa.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.

Planers—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Plumbers' and Gas Fitters' Supplies—
Berger Bros., Philadelphia, Pa.

Portable Engines and Boilers—
Armstrong Bros., Springfield, O.

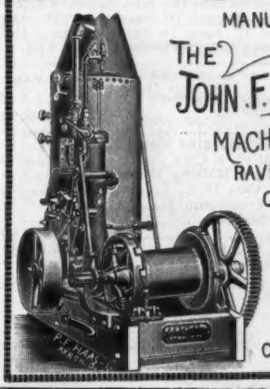
Portable Forges—
Foos Mfg. Co., Springfield, O.
Buffalo Forge Co., Buffalo, N Y.
Cady Mfg. Co., Cleveland, O.

Powder—
Hercules Powder Co., Cleveland.

Power Hammers—
W. H. Robertson, Chicago, Ill.

Power Plants—
Weston Engine Co., Painted Post, N. Y.
Presses—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cady Mfg. Co., Cleveland, O.
Pulleys—
Lane & Bodley Co., Cincinnati, O.
J. H. & D. Lake Co., Massillon, O.
Pulverizing Machinery—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Milling Machinery Co., Cleveland, O.
Pumps (Steam)—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Radial Drills—
Bickford Drill & Tool Co., Cincinnati, O.
Railroad Castings—
Vulcan Iron Works Co., Toledo, O.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.
Garden City Sand Co., Chicago, Ill.
Rock Breakers—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Machinery Co., Cleveland.
Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
Roofing (felt)—
Berger Bros., Philadelphia, Pa.
Consolidated Roofing Works, Columbus, O.
Rust Preventative—
Stevenson Bros. & Co., Philadelphia, Pa.
Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Saws—
Peter Gerlach & Co., Cleveland.
Schools—
Correspondence School of Mechanics, Scranton, Pa.
Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.
Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.
Screws—
Illinois Screw Co., Chicago, Ill.
Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
W. H. Robertson, Chicago, Ill.
Chicago Laundry Machine Co., Chicago, Ill.
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Smoke Consumer—
Brightman Stoker Co., Cleveland, O.
Smokeless Furnaces—
Brightman Stoker Co., Cleveland, O.
Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cady Mfg. Co., Cleveland, O.
Stamping and Punching—
Cady Mfg. Co., Cleveland, O.
Stand Pipes—
The J. C. McNeil Co., Akron, O.
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.
Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
Steel—
Wm. Jessop & Sons, Ltd. New York, N. Y.
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa.
Wm. Jessop & Sons, Ltd., New York, N. Y.
King & Andrew Co., Chicago, Ill.
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
James Murdock, Jr., Cincinnati, O.
Stokers—
Brightman Stoker Co., Cleveland, O.
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
Tinners' Hardware—
Berger Bros, Philadelphia, Pa.
Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.
Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
Tramways—
Trenton Iron Co., Trenton, N. J.
Trucks—
Detroit Foundry Equipment Co., Detroit, Mich.
Tumblers—
Detroit Foundry Equipment Co., Detroit, Mich
Turret Drills—
A. P. Quint, Hartford, Conn.
Twist Drills—
Cleveland Twist Drill Co., Cleveland.
Valves—
Berger Bros., Philadelphia, Pa.
Valve Gears—
Geo. Marshall, Fremont, Neb.
Vises—
Capital Machine Tool Co., Auburn, N. Y.
Ventilating Fans—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Washers—
Milton Mfg. Co., Milton, Pa.
Water, Gas and Steam Pipe—
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati O.
Well Drilling Machinery—
Williams Bros., Ithaca, N. Y.
Wheelbarrows—
Kilbourne & Jacobs Mfg. Co., Columbus, O.
Wire Fence Ratchets—
J. Stauffer, Dayton, O.
Wire Rope—
Trenton Iron Co., Trenton, N. J.
Wire Machinery—
John Adt & Son, New Haven, Conn.
Cady Mfg. Co., Cleveland, O.
Wood-Working Machinery—
J. A. Fay & Egan Co., Cincinnati, O.

HOISTING ENGINES



MANUF'D BY
THE JOHN F. BYERS MACHINE CO.
RAVENNA, OHIO.
WRITE FOR CATALOGUE.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7.45 am	†11.55 am
Pittsburgh, Bellaire and East	†12.45 pm	† 6.25 pm
Philadelphia and New York	* 1.40 pm	*11.15 am
Baltimore and Washington	* 1.40 pm	*11.15 am
Alliance and Pittsburgh	* 1.40 pm	*11.15 am
Ravenna and Alliance	† 3.25 pm	† 9.50 am
Hudson and Ravenna	* 5 .0 pm	* 8.25 am
Philadelphia and New York	*11.10 pm	* 5.25 am
Baltimore and Washington	*11.10 pm	* 5.25 am
Alliance and Pittsburgh	*11.10 pm	* 5.25 am

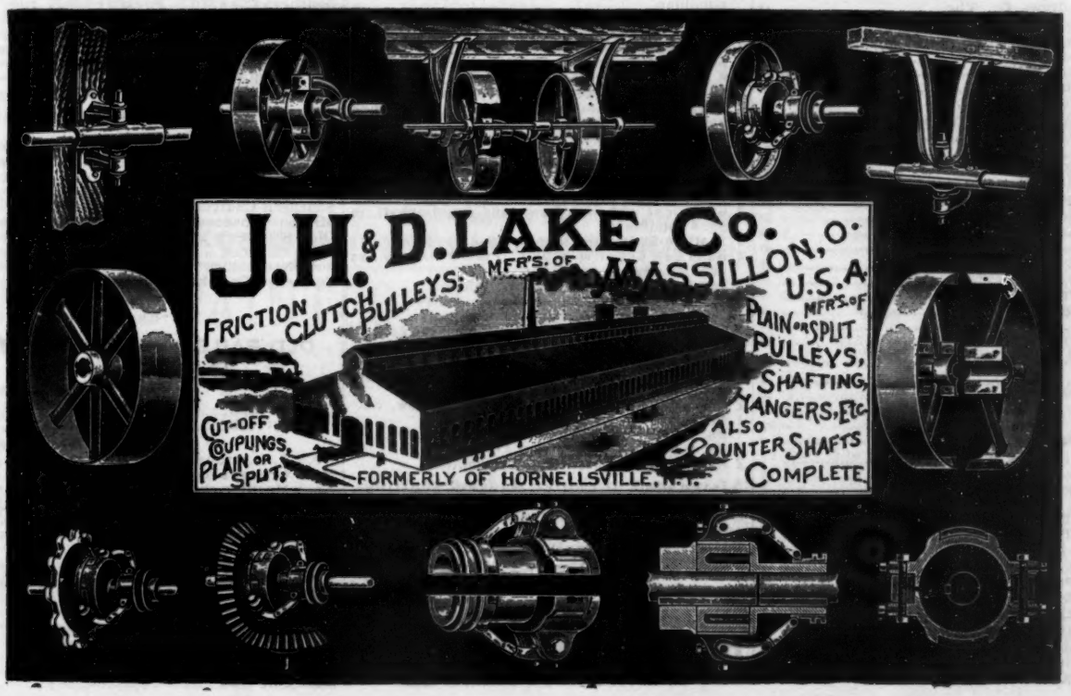
Mt. Vernon and Pan-Handle Route.

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8.40 am	* 5.25 pm
Akron, Columbus & Zanesville	†12.45 am	*11.55 pm
Akron and Columbus	* 8.40 pm	*5.25 pm
Akron and Orrville	† 3.25 pm	† 9.50 am
Columbus and Cincinnati	* 8.00 pm	* 7.00 am

Valley Ry. | Depot foot of So. Water St. City Office 143 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:40 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:40 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Garrett	†3:00 P M	†11:00 A M
Wooster	.....	*6:30 P M
Akron, Canton & Marietta	†3:00 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†3:00 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Compartment Sleeping cars between Cleveland and Chicago.



Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
*Acme Safety Emery Wheel Co	—
Adt, John & Son	29
Adams, C. P.	28
Aitchison, Rob't Perforated Metal Co	27
American Fire Brick & Clay Co	19
American Mining & Milling Machinery Co	22
Anderson & Co., Geo. H	21
*Anti-Chill Core Compound Co	—
Arcade File Works, The	1
Armstrong Bros	32
Armstrong Mfg. Co., John R	28
Artificial Gas Engineering Co	2
Babcock & Wilcox Co	32
Barnes Co., W. F. & John	23
*Berger Bros	32
*Berger Mfg. Co	—
Bickford Drill & Tool Co	23
Bickford, H	32
Biedler, Frank R	29 31
Billings & Spencer Co	2
Brightman Stoker Co	20
*Brownell & Co., The	—
Bucyrus Steam Shovel & Dredge Co	22
Buffalo Forge Co	1
Byers Machine Co., John T	25
Cady Mfg. Co	27
Capital Machine Tool Co., The	23
Cary & Moore	2
Chester Steel Casting Co	22
Chicago Heights Land Association	20
Chicago Laundry Machine Co	23
Cleveland City Forge & Iron Co	1
Cleveland Rolling Mill Co	29
Cleveland Stamping & Tool Co	21
Cleveland Twist Drill Co	32
Cleveland & Buffalo Transit Co	31
*C. M. & St. P. Ry	—
Cole, J. Wendell	32
Condit-Fuller Co	30
Connersville Blower Co	18
Consolidated Roofing Works	32
Correspondence School of Mechanics	28
Detroit Foundry Equipment Co	23
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co	27
Downerd & Son Co., The J	31
Eclipse Electrotype & Engraving Co	20
Empire Paint & Roofing Co	29
Fay & Egan Co., J. A	27
Fleharty, J. H. & Co	30
*Foos Mfg. Co	28
*Freeman & Sons Mfg. Co	31
Garden City Sand Co	18
Gerlach, Peter & Co	30
Greiner Economical Cupola Co,	31
Harrington & King Perforating Co	30
Hartford Steam Boiler Insp. & Ins. Co	22
*Hendrick Mfg. Co., Ltd	26
Hercules Powder Co	28
Hicks Gas Engine Co	—
Hill, Clarke Co	1
*Hodell, H. H. & Co	—
Hollis & Emmerton	2
Hunt & Co., Robert W	2
Illinois Screw Co	1
Iron Clad Paint Co	27
Jeffrey Mfg. Co	31
Jenks, James	30
Jessop & Sons, Ltd., Wm	23
Jones, E. H. & Co	32
Kilbourne & Jacobs Mfg. Co., The	2
King & Andrews Co., The	23
Lake Co., J. H. & D	25
*Lake Shore Iron Works	18
Lane & Bodley Co., The	22
Lloyd Booth Co	30
Long & Allstatter Co	21
Lyman, W. C	1
Magnolia Anti-Friction Metal Co	1
Marshall, Geo	23
McNeil Co., J. C	29
Milton Mfg. Co	32
Murdock, Jr., Jas	32
†Oak Hill Fire Brick & Coal Co	—
Oglebay, Norton & Co	30
Otto Gas Engine Co	30
Outhwaite, J. H. & Co	30
Parker, Richard A	31
Pemberton, Geo	32
Pollock, Wm. B. & Co	2
Pool, F. J. & H. R	1
Pope, E. C	30
Prentiss Tool & Supply Co	23
Quint, A. P	32
Rainey, W. J	1
Richards, M. V	26
*Robertson, W. H	23
Robertson, E. C	23
Robinson & Orr	2
‖Sharon Fire Brick Works	1
Sibell & Co., Geo. H	27
Spence & Son, L	2
Stauffer, J	29
Stevenson Bros. & Co	32
Stilwell & Bierce Co	2
Sykes Iron Roofing Co	29
Taylor & Boggis Foundry Co	1
Thurman Fuel Oil Burner Co	20
Tod, Wm. & Co	30
Toledo Machine & Tool Co	31
*Trenton Iron Co	—
Union Electrotype Foundry	32
Union Mining Co	19
Upson Nut Co	30
Van Duzen Gas Engine Co	2
Vulcan Iron Works	22
Walburn-Swenson Co	23
Weber Gas & Gasoline Engine Co	1
Wells Engine Co	31
Westmoreland Fire Brick Co	21
Weston Engine Co	1
*Williams Bros	32

PERFORATED SHEET METALS

OF EVERY DESCRIPTION,

FOR SCREENING PURPOSES.

THE HENDRICK MFG. CO., Ltd.,

CARBONDALE, PA.

POWER. MATERIAL.

Cheap Power, Desirable and Low-priced Labor, Abundant Supply of Raw Material and Market Facilities, are items always considered by Practical Manufacturers. The territory reached by the Baltimore and Ohio Railroad offers every advantage in the above, and manufacturers seeking new locations will find it to their interest to examine the opportunities afforded along that line before locating elsewhere. We will be pleased to confer or correspond with corporations or individuals and will afford them all the information or assistance neccessary in securing the most desirable locations.

M. V. RICHARDS,

Land and Immigration Agent, B. & O. R. R.,

Baltimore, Md.

LABOR. MARKETS.

ASSIGNEE'S SALE.

By order of Court the following Machines, etc., must be sold at once for cash:

1 32x32x9 ft. Pond Planer, as good as new.
1 20x10 ft. Engine Lathe (Hubbard), nearly new.
1 15x6 ft. " " (Prentiss Bros.) nearly new.
1 16x6 ft. " " (Porter), nearly new.
1 30x10 ft. " " (New Haven), in good condition.
1 26x6 ft. Boring Lathe with automatic feed, fair condition.
1 15 inch Steptoe Crank Shaper, as good as new.
1 10 inch Hughes & Phillips Shaper, in fine condition.
1 24 inch Back Geared Drill Press, in fine condition.
1 Sensitive Drill Press, as good as new.
1 4 Spindle Drill Press, as good as new.
1 28 inch Sliding Head Drill Press, in good condition.
1 Power Sawing Machine, (Millers Falls), in fine condition.
1 Northampton No. 3 Grinder with countershaft, as good as new.
1 Diamond Machine Co.'s No. 3 Grinder, with countershaft, as good as new.
1 Small Grinder with countershaft, good condition.
1 Grindstone with iron frame and countershaft, in good condition.
1 Shafting-Slotter or Miller, in good condition.
1 Hand Bolt Cutter with Dies, (Pratt & Whitney), as good as new.
1 Trip Hammer, in excellent condition.
1 2 Spindle Profiling Machine, same as new.
1 2 Ton Chain Blocks, same as new.
2 Forges, 2 Anvils and 2 Blowers, same as new.
1 Babbitting Stove (Delano's), in good condition.
1 Small Gear Cutter, in good condition.
1 Blakeslee No. 2 Hydraulic Pump, in good condition.
2 Squaring Shears (24 and 30 inch), old.
2 No. 3 Frech Patent Punching Presses, new.
1 No. 2 " " " " "
1 No. 1 " " " " "
2 No. 0 " " " " "
2 Hand Lever Presses, in good condition.

A large stock of Pullies, Haugers, Shaftings, Beltings, Vises, Files, Reamers, Dies, Taps, Drills, Castings, Iron, Steel, special Tools and Boring Machine for making Presses, Patterns, and three Patents for Frech Press, Drill Press and Lathe, Scales, Office Fixtures, Safes, etc., all contained in premises 75 and 77 West Van Buren Street.

Address all correspondence

HUGO PAM, Assignee,

75 W. Van Buren St., CHICAGO, ILL.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 3.00
Hematites No. 1 non-Bessemer	2.25@ 2.50
No 1. Specular, non-Bessemer	2.50@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$10 40@$10 60
No. 1 Strong Foundry	11 25@ 11 75
No. 2 Strong Foundry	10 25@ 10 75
No. 1 Gray Forge, red short	9 75@ 00 00
No. 2 Gray Forge, neutral	9 50@ 00 00
No. 1 American Scotch	11 65@ 12 00
No. 2 American Scotch	11 00@ 11 50
Lake Superior Charcoal	14 00@ 15 00
PITTSBURG:	
No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 50@ 11 00
Grey Forge	9 50@ 9 60
White and Mottled	9 00@ 9 25
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 50@ 00 00
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$15 00@$15 50
Local Coke Foundry No. 1	11 25@ 11 50
Local Coke Foundry No. 2	10 50@ 11 00
Local Coke Foundry No. 3	10 00@ 10 50
Local Scotch Foundry No. 1	11 50@ 11 75
Local Scotch Foundry No. 2	10 75@ 11 25
Local Scotch Foundry No. 3	10 25@ 10 75
Southern Coke No. 1	11 00@ 11 25
Southern Coke No. 2	10 25@ 10 50
Southern Coke No. 3	10 00@ 10 25
Southern No. 1 Soft	10 25@ 11 50
Southern No. 2 Soft	10 00@ 10 25
Southern Silveries No. 1	11 50
Southern Silveries No. 2	11 00
Southern Gray Forge	9 35@ 9 60
Jackson Co Silveries	14 60@ 15 00
Ohio Silveries No. 1	14 25@ 14 50
Ohio Silveries No. 2	11 75@ 12 00
Ohio Strong Softeners	12 60@ 12 85
Alabama Car Wheel	17 00@ 17 50
Southern Charcoal No. 1	13 75@ 14 00
Southern Charcoal No. 2	13 25@ 13 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$10 50@$10 75
Southern Coke No. 2 and No. 1 Soft	9 50@ 9 75
Hanging Rock Coke, No 1	12 50@ 13 00
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	14 50@ 16 00
Southern Coke, Grey Forge	8 75@ 9 00
" " Mottled	8 50@ 8 75
Standard Alabama Car Wheel	16 25@ 17 25
Tennessee " "	15 50@ 16 00
Lake Superior " "	16 00@ 16 50
BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$12 00
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 50
Ohio Softener No. 1	12 00
Jackson Co. Silvery No. 2	15 50@ 17 00
Lake Superior Charcoal	14 75
Tennessee Charcoal	15 50
Southern Soft No. 1	11 20
Southern Soft No. 2	10 70
Alabama Car Wheel	16 00@ 17 50
Hanging Rock Charcoal	18 50
LOUISVILLE (reported by Geo. H. Hull & Co.)	
Southern Coke No. 1 Foundry	$10 50@$10 75
Southern Coke No. 2 Foundry	9 00@ 9 50
Southern Coke No. 3 Foundry	8 50@ 8 75
Grey Forge	8 00@ 8 50
Southern Charcoal No. 1 Foundry	12 50@ 13 50
Car Wheel	15 00@ 15 50
Spathite	11 25@ 11 75
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$11 00@$11 25
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 50@ 9 75
Southern Grey Forge	9 25@ 9 50
Southern Charcoal No. 1	15 50@ 16 00
Missouri Charcoal No. 1	12 00@ 12 50
Ohio Softeners	14 50@ 15 00
Lake Superior	16 50@ 17 00
Southern	17 00@ 17 50
Connellsville Coke, St. Louis	4 50

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	GROSS TONS
Old iron rails	$13 00
Old steel rails	10 50
	NET TONS
No. 1 R. R. wrought scrap	$10 00
No. 1 wrought scrap	9 50
No. 1 Machine cast scrap	8 50
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	7 00
Cast borings	5 00
Uncut wrought iron boilers	4 00
Steel boiler plates	9 00
Grate bars	4 00
Pipes and flues (clean)	7 00
Tank iron	6 75
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	6 50
Malleable iron	7 50

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

283 W. River St., CLEVELAND, O.

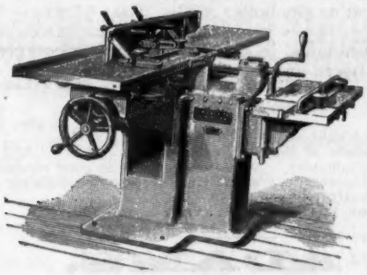
Power Presses, Dies,
Drop Hammers, Punches and
Shears, Special Machinery,
Wire Cutters and Straighteners.

J. A. FAY & CO.

286 to 306 W. Front St.,
CINCINNATI, OHIO,
U. S. A.

WOOD-CUTTING MACHINERY
FOR ANY PURPOSE.

MAKERS, INTRODUCERS AND ORIGINATORS.



NO. 2 VARIETY WOOD-WORKER.

The infinite variety of work performed by this machine has given it the position as the most useful one in existence for the working of wood. It is simply invaluable, for it is capable of almost every operation known to the art.

THE LONG LINE OF AWARDS, FROM 1851 DOWN TO THE "GRAND PRIX" AT PARIS, 1889, HAS BEEN ADDED TO BY THE CAPTURE OF THE "GRAND HONORS" AT THE WORLD'S FAIR, CHICAGO, 1893.

PATTERN AND FLASK MAKING MACHINERY, ETC., SUPPLIED.

The latest and most advanced ideas for fast, perfect and reliable productions.

PERFORATED METALS

OF ALL KINDS FOR
MILLING MINING AND
AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

Horse AND Mule Shoes

SHEETS, BARS, SLABS AND BILLETS.
Light Sheets for TINNING AND PERFORATING a Specialty.
Geo. H. Sibell & Co., 614-218 La Salle St., Chicago.

PL

DIXON'S PERFECT LUBRICATING GRAPHITE.
The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease
NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.
An Interesting and Instructive Pamphlet will be sent Free of Charge.
JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g,
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.30c@1.30c
Angles	1.25c@1.35c
Tees	1.35c@1.45c
Universal Plates	1.25c
Sheared Plates	1.35c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4½ to 6 by ⅜ to 1 inch	1 35
1¾ to 6 by 1⅛ to 2 inch	1 50
1¾ & 1⅜ by ¾ to ¾ inch	1 35
1 & 1⅛ by ⅜ to ¾ inch	1 40
⅝, ⅞, ⅞, by ⅜ to ¾ inch	1 50

Round and Square.

1 to 1⅞ inch	1 30
2 to 2⅜ inch	1 40
2¾ to 3¾ inch	1 55
3⅜ to 4 inch	1 80
4¼ to 4⅝ inch	2 40
4¾ to 5 inch	2 60

Oval.

⅞ to 1¼ inch	1 50
⅞ to ¾ inch	1 50
½	1 70
⅜	1 90

Half Oval and Half Round.

1⅛ to 3 inch	1 85
⅞ to 1½ inch	1 65
⅝ to ¾ inch	1 90
½	2 05
⅜	3 15

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 40
1 to 1⅜ by ¼ and 5-16 inch	1 45
¼ to ⅞ by ¼ and 5-16 inch	1 55
⅛ to ⅜ by ¼ and 5-16 inch	1 80

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 85
1 7-16 to 2, No. 17, 18 and 19	1 90
1 7-16 to 2, No. 20	2 00
1 7-16 to 2, No. 21	2 10
1 7-16 to 2, No. 22	2 20
1⅛ to 1⅜, No. 13, 14 and 15	1 90
1⅛ to 1⅜, No. 16, 17 and 18	1 95
1⅛ to 1⅜, No 19 and 20	2 00
1⅛ to 1⅜, No. 21	2 10
1⅛ to 1⅜, No. 22	2 20
15-16 and 1 inch, No. 13, 14 and 15	1 85
15-16 and 1 inch, No. 16, 17 and 18	2 00
15-16 and 1 inch, No. 19 and 20	2 10
15-16 and 1 inch, No. 21	2 20
15-16 and 1 inch, No. 22	2 30
⅞, No. 13, 14 and 15	2 10
⅞, No. 16, 17 and 18	2 20
⅞, No. 19 and 20	2 30
⅞, No. 21	2 40
⅞, No. 22	2 50
13-16, No. 13, 14 and 15	2 20
13-16, No. 16, 17 and 18	2 30
13-16, No. 19 and 20	2 40
13-16 No. 21	2 50
13-16, No. 22	2 60
¾, No. 13, 14 and 15	2 30
¾, No. 16, 17 and 18	2 45
¾, No. 19 and 20	2 55
¾, No. 21	2 65
¾, No. 22	2 75
11-16, No. 13, 14 and 15	2 55
11-16, No. 16, 17 and 18	2 60
11-16, No. 19 and 20	2 70
11-16, No. 21	2 80
11-16, No. 22	2 90
11-16, No. 23	3 00
⅝, No. 13, 14 and 15	2 60
⅝, No. 16, 17 and 18	2 70
⅝, No. 19 and 20	2 80
⅝, No. 21	2 90
⅝, No. 22	3 00
⅝, No. 23	3 10
9-16, No. 13, 14 and 15	2 80
9-16, No. 16, 17 and 18	2 90
9-16, No. and 20	3 00
9-16, No. 21	3 10
9-16, No. 22	3 20
9-16, No. 23	3 30
7-16 and ½ inch, No. 13, 14 and 15	3 00
7-16 and ½ inch, No. 16, 17 and 18	3 10
7-16 and ½ inch, No. 19 and 20	3 20
7-16 and ½ inch, No. 21	3 30
7-16 and ½ inch, No. 22	3 40
7-16 and ½ inch, No. 23	3 50
⅜, No. 13, 14 and 15	3 50
⅜, No. 16, 17 and 18	3 60
⅜, No. 19 and 20	3 70
⅜, No. 21	4 00
⅜, No. 22	4 10
⅜, No. 23	4 25

Light Band.

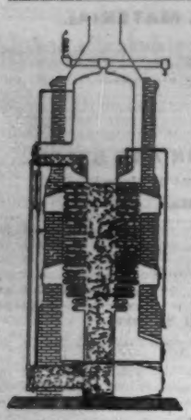
1¼ to 6 by ¼ to 3-16 inch	1 60
1⅛ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1 70
⅞ and 13-16 by ⅛ to 3-16 inch	1 80
⅞ and 13-16 by Nos. 11 and 12	1 85
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 80
⅞ inch, " " " " 13 and 14	1 90
¾ inch, " " " " 11 and 12	1 95
¾ inch, " " " " 13 and 14	2 15

Sheet Iron.

No. 10	1 85
No. 12	1 90
No. 14	1 95



THE ADAMS

WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

The Falcon Tin Plate & Sheet Co., }
NILES, O., Aug. 18, 1893. }

Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

THE FALCON TIN PLATE & SHEET CO.,
By Warner Arms, Pres't.

C. P. ADAMS,
807 The Cuyahoga, - CLEVELAND. O.

FUEL OIL BURNERS.

J. R. Armstrong's System of Burning

Crude Petroleum.

WHY IT IS THE BEST.

Send for Catalogue.

JOHN R. ARMSTONG COMPANY,
35 West Monroe St., Chicago, Ill.

THE CYCLONE PORTABLE FORGES

Have Double Ratchet, Solid Frame, Adjustable Legs, Detachable Lever.
Run Lightest, Make Strongest Blast & Last Longest.
ALL DESIRABLE STYLES AND SIZES.
Sold by Hardware and Machinery Dealers everywhere.
Send for Catalogue of these and
Hand & Power Blower, Blacksmith Drill Presses, &c.
THE FOOS MFC. CO. SPRINGFIELD, OHIO.

MAKE YOURSELF A Mechanical Engineer or Draughtsman; or qualify to take charge of, or to superintend the manufacture of machinery by devoting your idle hours to Home Study by the method of THE CORRESPONDENCE SCHOOL OF MECHANICS, Scranton, Pa. To begin, students need only know how to read and write. Moderate Charges. Send for FREE Circular.

HERCULES POWDER

SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE
Known to the Arts.
POWDER, FUSE, CAPS,
Electric Mining Goods,
AND ALL TOOLS FOR STUMP BLASTING,
FOR SALE BY THE
HERCULES POWDER COMPANY,
710 Cuyahoga Bldg., Cleveland, O.
J. W. WILLARD, Manger.

HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR.

Subscribe for the Iron Trade Review, $3 per year.

No. 15-17	2 05
No. 18	2 20
No. 20	2 30
No. 22-24	2 40
No. 25-26	2 50
No. 27	2 60

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 60
Shell	1 85
Flange	2 10
Marine Flange	2 35
Fire Box	3 35
Above includes plates 90 inches wide.	
90 to 96 in. wide	⅜c. ℔. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in, inclusive	08
9-16 to ½ in. "	08½
7-16 to ⅜ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅜ to 11-16 and 4⅛	10
⅛ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	11
3-16 in	13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	8

Bessemer and O. H. Steel.

Machinery	base price, 1 80
Tire	" 1 85
Spring	" 2 20
Sleigh Shoe	" 2 20
Toe Calk	" 2 05
Cutter Shoes, tapered and bent	" 2 45

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 70
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 40

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ ℔ 9@10
Wright's	₩ ℔ 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&5
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 35
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

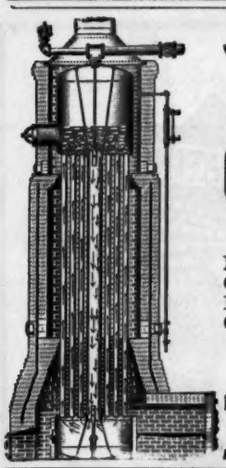
Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F F. FF.
Kegs, ₩ ℔	4½c	5 c	2½c
½ kegs ₩ ℔	4¾c	5¼c	2¾c
¼ kegs ₩ ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6½c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c



J. C. McNEIL CO.,

AKRON, OHIO,

SOLE BUILDERS OF THE

Cook Patent Water Tube Boiler

THE ONLY PERFECT WASTE-HEAT BOILER.

No incrustation.
Generates the greatest amount steam with least amount heat.
Repairs reduced to a minimum.
Can be used equally as well for direct firing or with natural gas.

WE ARE ALSO BUILDERS OF

HORIZONTAL, TUBULAR, AND FLUE BOILERS, OIL TANKS AND WATER STAND PIPES.

☞Estimates furnished promptly on receipt of specifications.

FRANK R. BIEDLER,

(PRINCIPAL)
Baltimore Offices,
Equitable Building,

(BRANCH)
New York Offices
Welles Building,
18 Broadway.

MINING MINERAL AND TIMBER LANDS.

Municipal Bonds,
Farm and City Mortgages,
Short Time Paper.

Large Tracts of Florida
Phosphate and
Hammock Lands.

EXAMINATIONS AND REPORTS MADE. ☞Correspondence Solicited.

EUREKA FENCE RATCHET.

SIMPLE, STRONG AND CONVENIENT TO HANDLE.

All parts held together by a pin inside of box; no losing of pawls or rollers. It can be adjusted quickly and be bought cheap. Both large and small sizes. Write for prices and terms. Address,

J. STAUFFER, 1630 East 3d St., Dayton, O.

CLEVELAND ROLLING MILL CO.,

CLEVELAND, - OHIO,

—MANUFACTURERS OF—

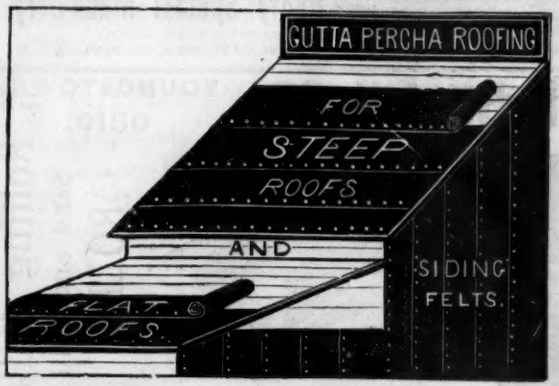
BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., • Chicago and Niles, O.



BEST AND CHEAPEST

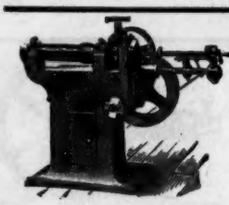
ROOFING

For Iron Works, Foundries, Mills and Factories.

Elastic Paint for Metal Roofs and Siding only 60c. per gallon in bbls.

Send for Catalogue and references from hundreds of the largest Manufacturing firms in the United States. Also Water Proof Siding and Sheathing Paper.

Empire Paint & Roofing Co.,
111 N. Fourth St.,
PHILADELPHIA, PA.

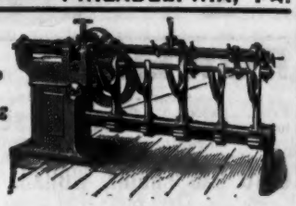


JOHN ADT & SON,

New Haven, Conn.

Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Screw Cutters, Etc.



Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 55@60
Norton's	dis 55@60
Grant	dis 55@60
Sterling	dis 60
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F.	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs.	15c
" " " over 5 lbs.	12c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¾	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3½	3¼
Hexagon	15½	11½	8¼	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4¼

In lots less than 100 lbs, ⅛ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 85
Standard Penny Nails, ⅛ keg card rate	
{ Car lots	$1.20
{ Less than car lots	$1.35

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ⅛ doz	dis 10@10&10

Packing, Steam.

Boston Belting Co.	dis 60
American Packing Hemp	⅛ lb 9@10
Russia " "	⅛ lb 14
Italian " "	⅛ lb 13@19
Plumbago Piston	⅛ lb 40
Peerless	⅛ lb 60
Morrison's "	⅛ lb 45
Square Flax "	⅛ lb 50
Sheet Rubber	⅛ lb 12&24
Excelsior Rubber	⅛ lb 48
Rainbow { Full Rolls	45c ⅛ lb
Rainbow { Less than Full Rolls	50c ⅛ lb
Eclipse Gasket	⅛ lb 75

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 50
Medart Pulleys	dis 50
Split Wood Pulleys	dis 55@60

Rivets.

Iron, Thousand, list November 17	dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17	dis 50&10@60
Copper	dis 50@50&10

Saws.

Disston's Circular	dis 40&10
" Band	dis 25
" Scroll	Net
Hack Saw Stubs	dis 20
" " Eureka	dis 20
" " Star	dis 20
Saw Swages Diston's	dis 30
Atkins' Circular Saws	dis 40&45
" Mill, Mulay and Drag Saws	dis 40&10
" Wood Saws	dis 40&10
" Silver Steel Diamond Cross-cut Saws	70c per ft
" Dexter Cross-cuts	50c "
" Diamond "	30c "
" Tuttle Tooth Cross-cuts	25c "
" One-man Cross-cuts	32c "
No. 1 Handles	23c per pair
No. 6 "	16c "
Excelsior Saw Tools	$6 per doz
Derfection "	$15 "
Petroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanised Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stampes Seals, Stencils, Automatic Check Punchs, and Numbering Machines. 92 Seneca St.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.

Factories on Columbus, Winter and Leonard Sts

Cleveland, Ohio. U. S. A.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,

Successors to Tuttle, Oglebay & Co.

Commission Dealers in

IRON ORES,

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS.

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

IRON ORE.

Perry-Payne B'ld'g, - Cleveland, O.

FOR
ARTISTIC
PRINTING
WRITE
THE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND, O.

THE S. T. W. EJECTOR.

SIMPLEST, BEST and

CHEAPEST PUMP made.

SEND FOR CIRCULAR.

James Jenks,

199 JEFFERSON AVE.,

Detroit, Mich.

STEEL, IRON, COPPER, ZINC, BRASS, TIN,

And all Other Metals Perforated as Required for

GRAIN CLEANING AND MINING MACHINERY,
WOOLEN, COTTON, PAPER AND PULP MILLS,
RICE, FLOUR AND COTTON SEED OIL MILLS,
SUGAR AND MALT HOUSES, DISTILLERIES, FILTER PRESSES,
STONE, COAL AND ORE SCREENS,
BRICK AND TILE WORKS, FILTERS,
SPARK ARRESTERS, GAS AND WATER WORKS,
OIL, GAS AND VAPOR STOVES,
COFFEE MACHINERY, ETC., ETC.

STANDARD SIZES PERFORATED TIN AND BRASS ALWAYS IN STOCK.

THE HARRINGTON & KING PERF. CO.,

Main Office and Works, 222 to 240 N. Union St., Chicago, Ill., U. S. A.

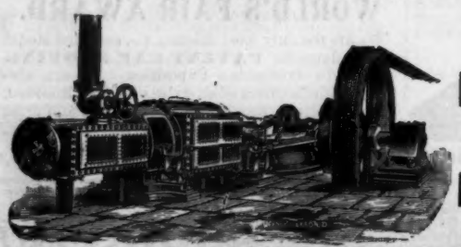
Eastern Office, No. 284 Pearl St., New York.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

THE PORTER-HAMILTON ENGINE

SINGLE, COMPOUND & CONDENSING



Blowing Engines.

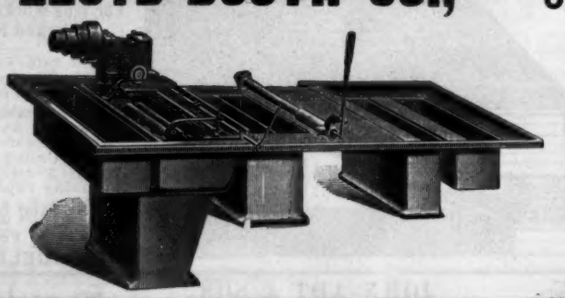
Hydraulic Cranes and Accumulators.

Heavy Special Machinery.

ENGINE CATALOGUE ON APPLICATION

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY.



Rolling Mills, Sand and Chill ROLLS.

POWER From **GAS OR GASOLINE.**

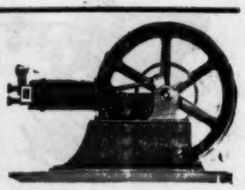
No Steam, Coal, Ash, Gauges, Engineer nor Danger.

From 1 to 100 horse-power. } **Can be Used in City or Country.**

In conjunction with our Producer Gas Apparatus, we guarantee coal consumption of 1¼ pounds per hour per h.p.

OTTO GAS ENGINE WORKS., 33rd & Walnut Sts. PHILADELPHIA, PA.

S. M. York, 40 S. Water St., Cleveland Agent.

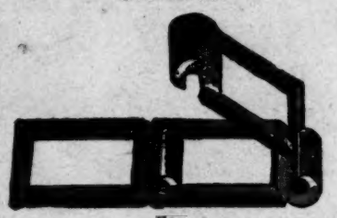


JEFFREY

Chain Belting

—ALSO—

MALLEABLE, STEEL, WROUGHT AND SPECIAL CHAINS.



FOR

ELEVATING AND CONVEYING MACHINERY

Send for Illustrated Catalogue.

REDUCED PRICE LIST.

THE JEFFREY MFG CO.

143 E. First Ave., Columbus, O.
New York Branch, 163 Washington St.

FOR SALE

In Florida,

Several thousand acres of the choicest orange and vegetable lands, including some of the most valuable muck beds and beautiful lakes in the States, all situated within three miles of railroad station.

THESE LANDS WILL BE SOLD TO ACTUAL SETTLERS

At prices defying competition.

I have large tracts from 200 to 5,000 acres, grazing, farm, garden and orange lands, also several valuable phosphate beds near Dunnellon and Anthony, Marion County. Address

FRANK R. BIEDLER, BALTIMORE, MD.

RICHARD A. PARKER., C. E.,

Consulting Mining Engineer.

—SPECIALTIES—

Iron, Gold and Silver Mining.

Offices: { 100 W. Washington St., CHICAGO. / MARQUETTE, MICH.

$2.50 CLEVELAND TO BUFFALO.

VIA "C. & B. LINE."

Commencing with opening of navigation (about April 1st.) Magnificent side-wheel steel steamers

"State of Ohio" and "State of New York."

DAILY TIME TABLE.

SUNDAY INCLUDED.

Lv. Cleveland, 6:15 P. M. | Lv. Buffalo - 6:15 P. M.
Ar. Buffalo, - 7:30 A. M. | Ar. Cleveland, 7:30 A. M.

CENTRAL STANDARD TIME.

Take the "C. & B. Line" steamers and enjoy a refreshing night's rest when en route to Buffalo, Niagara Falls, Toronto, New York, Boston, Albany, 1,000 Islands, or any Eastern or Canadian point.

Cheap Excursions Weekly to Niagara Falls.

Write for Tourist Pamphlet.

H. B. ROGERS, Gen'l Pass. Agt., Cleveland, O.
T. F. NEWMAN, Gen'l Manager.

VERTICAL

Balanced Compound Engines

FOR

ROLLING MILLS AND BLAST FURNACES,

Direct Connections.

Any variations of speed desired. Guaranteed more economical, powerful and durable than any type of engine in use.

WELLS ENGINE CO.,

91 Liberty St., New York City.

THE GREINER ECONOMICAL CUPOLA.

Cupolas Built or System Applied to any Cupola.

15 Per Cent Saving in Fuel Guaranteed.

Over 500 in Use.

WRITE

The GREINER ECONOMICAL CUPOLA CO.,

714 Bort Building, Chicago.

THE TOLEDO MACHINE & TOOL CO.

501-505 Superior St., Toledo, Ohio.

We manufacture

No. 34 Power Press.

Power Punches, Forging Presses,
Power Presses, Trimming Presses,
Straight Sided Double Pitman Presses,
Drop Presses,
Embossing Presses, Automatic Feed Presses,
Stamping Presses, Power Slitting Machines,
Riveting Machines, Power Shears.

Special and Automatic Machinery Dies for all classes of work in sheet metals,

Write for catalogue and prices.

No. 31 Power Press

S. FREEMAN & SONS MFG. CO.,

11 BRIDGE ST., RACINE, WIS.

MANUFACTURERS OF

Standard Tubular, FireBox, Vertical and Submerged Tube Steel

BOILERS

For Marine, Stationary, or Portable use.

ALSO OF

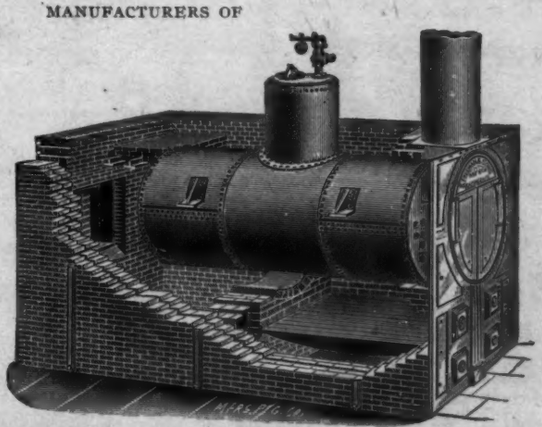
TANKS

OF ALL KINDS.

Smokestacks, etc., - -

- - Grey Iron Castings.

Write for Prices and Terms.



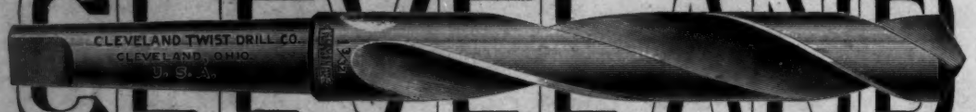
MOULDING SAND, FIRE SAND,

Fire Clay, Fire Brick, Circle Brick for lining cupolas Bristle Brushes, Steel Wire Brushes, Bellows, Riddles, Shovels, Foundry Facings, Foundry Barrows, Pig Iron Barrows.

THE BEST GOODS AT REASONABLE PRICES.

THE J. DOWNERD & SON CO., ZANESVILLE, O.

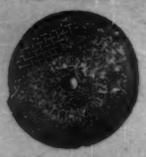
CLEVELAND



1874—OLD (SEND FOR CATALOGUE. WRITE FOR DISCOUNT.) RELIABLE—1894

THE HART OR DETROIT

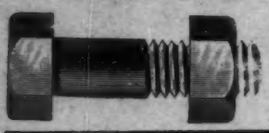
Emery Corundum Wheels and Machinery.



Write to J. WENDELL COLE, M. E.,
District Manager, Box 152, Chicago, Ill., or Box 84, Columbus, O.

☞ N. B.—Also Agent for WM. SELLERS & CO.'s SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

WROUGHT WASHERS,



MACHINE BOLTS, HOT PRESSED NUTS,
HIGHEST STANDARD OF EXCELLENCE.
The MILTON MFG. CO., MILTON, PA.

5 Horse Power Engine and Boiler $165
SAW MILL ENGINE AND BOILER.
$450.
Other sizes in Proportion.
Engines and Boilers 2 to 500 H. P.
For Circulars address
Armstrong Bros., Springfield, O.

JAS. MURDOCK, JR.,

MANUFACTURER OF
Steel Stamps, Alphabets and Figures, Time and Tool Room Checks, Sheet Metal Stamped Goods.
52-60 Longworth Street,
CINCINNATI, O.

E. H. JONES & CO.,

ENGINEERS & CONTRACTORS. 54 Frankfort St., Cleveland, O.

Steam Plant Complete. Engines, Boilers, Pumps, Heaters, Etc.
Steam and Hot Water Heating.

STURTEVANT'S BLOWER, COILS, Etc., for Hot Blast Heating.

Awarded the GRAND PRIZE at the Paris Exhibition.

SEND FOR THIS BOOK
FREE ON APPLICATION.
THE BABCOCK & WILCOX CO
30 CORTLANDT ST. N.Y.
BRANCH OFFICES
BOSTON, MASS. 8 OLIVER ST.
PHILADELPHIA, PA. 32 N. 5TH ST.
PITTSBURGH, PA. 408 LEWIS BLOCK.
CLEVELAND, O. 412 PERRY-PAYNE BG
CHICAGO, ILL. 45 S. JEFFERSON ST.
MINNEAPOLIS, MINN. 604 CORN EX.
NEW ORLEANS, LA. 57 CARONDELET ST.
HAVANA, CUBA. 116½ CALLE DE LA HABANA.
WATER TUBE
STEAM BOILERS
MANUFACTORIES IN UNITED STATES, SCOTLAND, FRANCE, GERMANY & AUSTRIA.

Cleveland Office, 412 Perry-Payne Building, Cleveland, O.

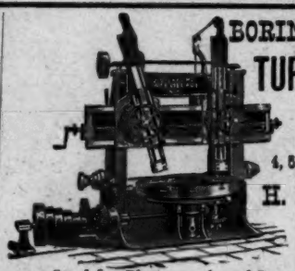
ASPHALT SEAMLESS ROOFING

The maximum results with a minimum expense, with complete adaptability for the highest structural requirements.
Manufactured by
Consolidated Roofing Works, Columbus, O.
M. H. CRITTENDEN & SON, Minneapolis, Minn. | MILLER OIL CO., Indianapolis, Ind. | H. M. REYNOLDS & SON, Grand Rapids, Mich.

COSMETIC

For Preventing Rust on Bright Surfaces
Is not only USEFUL but is A NECESSITY to all
Manufacturers and Shippers of Bright Machinery, Tools, Locomotives, Steam Engines, Etc.
To learn all about it address STEVENSON, BRO. & CO.,
132 South Second St., Philadelphia.

BORING AND TURNING MILLS,



4, 5 & 5 Ft. Swing.
H. Bickford,
Lakeport,
N. H.
Send for Photograph and Low Price.

BERGER BROS.

TINNERS' HARDWARE and ROOFERS' SUPPLIES.

The best Eave Trough Hangers and Pipe Fasteners on earth. Berger's Long Eave Gutter, Pipe Hooks and Fasteners of every description. Also Ridging, Crestings, Finials, Registers and Ventilators. Don't buy until you have our price. Samples and catalogue free.
237 Arch St., PHILADELPHIA, PA.

QUINT'S TURRET DRILL,

SIX SPINDLE.

The most durable and sensitive multiple drill made for drilling from 0 to ½ in. All holes drilled in centre of table. Speed of drills from 50 to 2,000 revolutions. Tapping attachment furnished. ☞ Send for circular.
A. P. QUINT, Hartford, Conn.

WELL DRILLING MACHINERY.

MANUFACTURED BY
WILLIAMS BROTHERS.
ITHACA, N.Y.

MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER
SEND FOR CATALOGUE
ADDRESS WILLIAMS BROS. ITHACA, N.Y.

UNION ELECTROTYPE FOUNDRY

TELEPHONE 2129
829 SHERIFF ST. CLEVELAND O.

GEORGE PEMBERTON,

18 Broadway, - New York.

Mining, Mineral and Timber Lands.

Municipal Bonds, Farm and City Mortgages, Short Time Paper. Large Tracts of Florida Phosphates and Hammock Lands. Investment Securities of all kinds bought and sold on commission.

Correspondence Solicited.

ADVERTISE IN
THE IRON TRADE REVIEW.
Its readers are subscribers.